

A Brief Summary of the Four Pillars of the Third Industrial Revolution

The great pivotal economic changes in world history have occurred when new energy regimes converge with new communication regimes. Today, the same design principles and smart technologies that made possible the internet, and vast “distributed” global communication networks, are just beginning to be used to reconfigure the world’s power grids so that people can produce renewable energy and share it peer-to-peer, just like they now produce and share information, creating a new, decentralized form of energy use. We need to envision a future in which millions of individuals can collect and produce locally generated renewable energy in their homes, offices, factories, and vehicles, store that energy in the form of hydrogen, and share their power generation with each other across a continent-wide intelligent intergrid.

The Four Pillars of the Third Industrial Revolution

The creation of a renewable energy regime, loaded by buildings, partially stored in the form of hydrogen, and distributed via smart intergrids, opens the door to a Third Industrial Revolution and should have as powerful an economic multiplier effect in the 21st century as the convergence of mass print technology with coal and steam power technology in the 19th century, and the coming together of electrical forms of communication with oil and the internal combustion engine in the 20th century.

The First Pillar: Renewable Energy

Renewable forms of energy—solar, wind, hydro, geothermal, ocean waves, and biomass—make up the first of the four pillars of the Third Industrial Revolution. By becoming the first superpower to establish a mandatory target of 20 percent renewable energy by 2020, the EU has set in motion the process of vastly enlarging the renewable energy portion of its energy mix.

The Second Pillar: Buildings as Positive Power Plants

While renewable energy is found everywhere and new technologies are allowing us to harness it more cheaply and efficiently, we need infrastructure to load it. Over the next 40 years, millions of buildings – homes, offices, shopping malls, industrial and technology parks – will be renovated or constructed to serve as both “power plants” and habitats. These buildings will collect and generate energy locally from the sun, wind, garbage, agricultural and forestry waste, ocean waves and tides, hydro and geothermal– enough energy to provide for their own power needs as well as surplus energy that can be shared.

The Third Pillar: Hydrogen Storage

The introduction of the first two pillars of the Third Industrial Revolution- renewable energy and “buildings as power plants”- requires the simultaneous introduction of the third pillar of the Third Industrial Revolution. To maximize renewable energy and to minimize cost it will be necessary to develop storage methods that facilitate the conversion of intermittent supplies of these energy sources into reliable assets. Batteries, differentiated water pumping, and other media, can provide limited storage capacity. There is, however, one storage medium that is widely available and can be relatively efficient. Hydrogen is the universal medium that “stores” all forms of renewable energy to assure that a stable and reliable supply is available for power generation and, equally important, for transport. In 2008, the European Commission announced a Joint Technology Initiative (JTI), an ambitious public/private partnership, to speed the commercial introduction of a hydrogen economy in the 27 member states of the EU, with the primary focus on producing hydrogen from renewable sources of energy.

The Fourth Pillar: Smartgrids and Plug-in Vehicles

By benchmarking a shift to renewable energy, advancing the notion of buildings as power plants, and funding an aggressive

hydrogen fuel cell technology R&D program, the EU has erected the first three pillars of the Third Industrial Revolution. The fourth pillar, the reconfiguration of the European power grid, along the lines of the internet, allowing businesses and homeowners to produce their own energy and share it with each other, is just now being tested by power companies in Europe.

The new smart grids or intergrids will revolutionize the way electricity is produced and delivered. Millions of existing and new buildings—homes, offices, factories—will be converted or built to serve as “positive power plants” that can capture local renewable energy—solar, wind, geothermal, biomass, hydro, and ocean waves—to create electricity to power the buildings, while sharing the surplus power with others across smart intergrids, just like we now produce our own information and share it with each other across the Internet.

The electricity we produce in our buildings from renewable energy will also be used to power electric plug-in cars or to create hydrogen to power fuel cell vehicles. The electric plug in vehicles, in turn, will also serve as portable power plants that can sell electricity back to the main grid.

Just as second generation information systems grid technologies allow businesses to connect thousands of desktop computers, creating far more distributed computing power than even the most powerful centralized computers that exist, millions of local producers of renewable energy, with access to intelligent utility networks, can potentially produce and share far more distributed power and help the EU reach the goal of decarbonizing the electricity supply by 2050.

The shift to a Third Industrial Revolution infrastructure will require a massive public-private financial commitment. We will need to retool the automotive industry, reconfigure the power grid,

and convert millions of commercial and residential buildings into positive power plants. Laying out the new infrastructure will cost hundreds of billions of dollars. Some argue that we can't afford it. But, then, they will need to explain to us how they expect to re-grow a debt-ridden global economy dependant on a failing energy regime.

The Third Industrial Revolution brings with it a new era of "distributed capitalism" in which millions of existing and new businesses and homeowners become energy players. In the process, we will create millions of green jobs, jump start a new technology revolution, and dramatically increase productivity, as well as mitigate climate change.

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