#2 – Energy and Resource Availability in 2039

Global Recession Unleashes Race to Achieve a Sustainable Planet

Forecasts:

- **In 2039, energy solutions and programmable materials yield cheap abundance of synthetic crops and pure water, ending scarcity of basic resources.**
- **Extravagant materialism "goes virtual" as public consciousness comes to revere efficiency, modesty and conservation in the physical world.**

Converging global threats revealed a somber truth: that a culture of unabated consumerism would be unsustainable on a planet with finite resources and a growing population. With an energy crisis, climate change, a growing rich-poor bifurcation and networked extremism, globalization needed a makeover. The 2008 financial meltdown marked the end of an ostentatious era by shocking everyone from families to major corporations into being more frugal, saving more, and making long-term, careful investments instead of spending frivolously. Yet, to propel the economy through this period of purse-tightening, "overconsumption" needed to be replaced by a new locomotive for the world economy. The U.S. seized this opportunity by passing the 2010 National Security Reform Package, which broadened the scope of our national security to prioritize innovation for energy independence and environmental sustainability in order to sustain growth and improve security. This policy shift officially completed the Cold War era "Military Industrial Complex," giving birth to the 21st Century "Eco-Energy Industrial Complex."

The backbone of this transition was the Department of Energy (DoE)'s Advanced Research Projects Agency for Energy (ARPA-E), whose efforts focused on innovation for both infrastructure and renewable energy sources. The energy infrastructure overhaul of the 2010's brought the first ultra-efficient smart-grids for energy conservation and laced our buildings and cities with smart sensors to conserve power when devices went unused. Concurrently, aggressive new performance standards forced the upgrade to a more advanced, superefficient technological infrastructure that drastically cut waste in energy as well as water and food. These efficiency measures slashed excess energy consumption by roughly two-thirds, and the accompanying creation of "Green-Collar Jobs" to build this new foundation was crucial for stymieing the 2009 Great Recession and revving up the Green Boom of the 2010's.

China, India and European countries followed suit. Around the world, megacities emerged in the late 2010's that were strategically designed to meet rigorous energy efficiency standards for carbon neutrality and resource efficiency. Large reservoirs were built to catch and store rain water and precision-agriculture greatly improved crop yields. By 2025 these resource-efficient megacities accounted for half of the world's population and proved invaluable for reducing the strains of population growth, which would have been unsustainable otherwise. Concurrently, militaries began to reprioritize policing and peacekeeping roles over war-fighting in order to deal with massive population shifts, particularly the megacities' absorption of environmental refugees as the climate crisis deepened. These measures for efficiency averted a major energy and resource catastrophe, buying time for the Green Technology Revolution to truly take off.

The 2020's saw early renewable energy sources (wind, solar, geothermal and tidal) finally achieve a commanding market share, while waste storage issues caused public sentiment to turn permanently against nuclear power. As the private sector assumed command of these smaller-scale energy alternatives, ARPA-E transitioned its focus to support research on grand technology projects for ultimate long-range energy sustainability. Several of these technologies, such as hydrogen fuel cells, carbon storage and sequestration (CSS) and carbon-eating algae began to reach the mass development stage in the mid-2020's, shaping the Green Technology Revolution of the 2030's that brought the first truly carbon-neutral manufacturing and transportation systems. In 2039, the fossil fuels alliance of Russia, the African Union (AU), Latin American countries and the newly-established Islamic Union (IU) are struggling to retain their market share as the world embraces a Global Green Economy.

Coinciding with the energy revolution was the revolution in smart materials, which first permeated the market in the late 2010's. Nanotechnology and synthetic biotechnology yielded renewable products that no longer converted to waste. For example, "resilient nanomesh" was a revolutionary technology that swiftly replaced paper for everything from towels and toilet paper to dynamic printed documents. The American consumer mindset was permanently transformed, with the middle class now competing for the most energy- and resource-efficient cars and houses rather than the biggest and most extravagant. Conservation became a sort of spiritual practice in the West and around the world. The maturation of the internet brought the semantic web and advanced virtual worlds, transplanting materialism to a virtual environment. What emerged was a stark juxtaposition of modest conservationism in the physical world and excessive quasi-material decadence in the virtual world.

As nanotechnology and biotechnology matured in the late 2020's and early 2030's, processes for programming and fabricating physical materials began to provide robust methods for producing cheap and abundant food and water resources. Nutritious plant-based foods and synthetic meats could be cheaply engineered and fabricated in a few short days. In 2039, the end of world hunger is in sight. The population has begun to level off and is projected to decline due to resource abundance. Because synthetic food and water production is mechanized at the nano-scale, these processes are pristinely energy-efficient. Even the more energy-intensive processes like water desalinization are supported by energy abundance from myriad sources. This smart materials revolution exploited open-source standards that placed power in the hands of those possessing 3D programming knowledge and skills.

By 2039, the problem of energy scarcity has been convincingly solved by a series of sequential innovation waves. Nano- and bio-technology-based fabricators empower anyone with basic programming skills to engineer an unlimited supply of pure water and nutritious synthetic food out of cheap, basic materials. Concurrently, environmental awareness has saturated public consciousness in the physical world as our competitive urge to produce and own extravagant items is satisfied in the virtual economy of a mature internet. High-tech tools and a conservation-oriented public consciousness yield an abundance of essential resources.

Further Reading:

- The Project on National Security Reform www.pnsr.org
- Weiss, Charles and William B. Bonvillian. "Demand and Supply: Stimulating U.S. Technological Innovation in Energy" 2008 (Draft)
- Millennium Project energy scenarios (www.millennium-projecct.org)
- Tom Friedman, *Hot, Flat and Crowded*
- Mandel, Michael. "How to Get Growth Back on Track." Business Week, 27 October 2008.