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Foreword

History generally believes that technology begin with the Neolithic Revolution around 12,000 years ago. Transitioning from hunting and gathering to one of agriculture and settlement providing the social structure to support a growing population. Further research indicates this helped to transform small and mobile groups of hunter-gathers into societies based in built-up villages and towns.

Ancient Greek technology developed during the 5th century BC continuing up to and including the Roman period. Numerous inventions credited to the Greeks include water clocks, gears, screws, torsion catapult, bronze casting, and the very beginning of the use of steam in experimental machines and toys.

The Roman technology period supported their civilization and made the expansion of their commerce and military possible for nearly a thousand years. Often they borrowed or absorbed the culture of previous existing peoples of the Mediterranean basin. Things such as civil engineering, construction materials, transport technology, and inventions like the mechanical reapers became part of the heritage.

Medieval technology came about in medieval Europe under Christian rule. After the Renaissance of the 12th century, medieval Europe saw a radical change in the rate of new inventions. The adoption of gunpowder, invention of the vertical windmill, mechanical clocks, and water mills that extended from agriculture to mills for wood and stone.

Renaissance technology spans the Renaissance period from the 14th through the 16th century. The printing press, double shell domes, and bastion fortresses. Renaissance science helped to develop the Scientific Revolution and science and technology began to develop together.

The Industrial Revolution from 1760 through 1840 saw the transition to new manufacturing processes. From hand to machine manufacturing, new chemical manufacturing and iron production followed by new water and steam power to the development of machine tools.

The Second Industrial Revolution began around 1850 with the introduction of Bessemer steel and continued to roughly the beginning of World War I. The expansion of the railroad, large-scale iron and steel productions, increased use of oil and the beginning usage of electricity marked this period. Countries to capitalize on this were primarily Britain, Germany, the United States, Western Europe, and Japan.

The Atomic Age burst onto the world with the detonation of the first nuclear bomb on July 16, 1945. Initially considered in 1933, the first artificial self-sustaining nuclear chain reaction took place in Chicago in December 1942. The Trinity test and subsequent bombing of Hiroshima and Nagasaki in Japan ended World War II. The developing nuclear technology represented the first large- scale use and further lead to a radical change in the definition of power and science.

The Jet Age soon followed with developments in both military and commercial applications. Airlines and military aircraft could fly higher and faster than ever before. Trans-Atlantic and Pacific

Ocean crossings in non-stop flights made this new development appealing to the general public. While not a commercial success, the advent of the SST – super-sonic transport, opened the minds to every person involved in aviation of the possibilities ahead.

The Space Age developed in the minds of dreamers and children many years ahead of the Space Race. Many aspects to this new age culminated on October 4, 1957 with the launch of Sputnik 1 by the Soviet Union. As the first artificial satellite, weighing 183 pounds and orbiting the earth in 98.1 minutes, the eye-opening event created a new era of political, scientific, and technological breakthroughs in man's achievements.

The Digital Revolution or Third Industrial Revolution changed the old world of analog, mechanical, and electronic technology to digital technology. Computers, digital cellular phones, and the Internet opened the world to smaller and faster, crossing almost every boundary in manufacturing and communications.

The Information Age developed at nearly the same time as the Digital Revolution as the power of the Internet crossed borders and increased people's and company's knowledge of their neighbor, their country, and their world. Soon information rather than money determined the power of a country or the economy.

Energy experts and financial analysis predicted the oil surplus of 2013 and 2014 to last until 2017. Many financial speculators invested huge sums of money that the cost of oil would not drop below \$32.75 per barrel. All financial models favored this probable outcome until the Solar Age started in 2018. As a result, trillions of financial wealth was lost on oil speculation. Every financial market in the world felt the effect when oil lost nearly all previous value.

For nearly 180 years, research scientist and engineers built on the foundation established by French physicist Edmond Becquerel. In 1839, at only 19 years of age, he experimentally demonstrated the first photovoltaic effect. In 1883, Charles Fritts built the first solid-state photovoltaic cell by coating the semiconductor selenium with a thin layer of gold to form the junctions and produced a conversion efficiency of only 1 percent.

The first practical photovoltaic cell developed in 1954. The efficiency of solar cells continued to improve with most commercial applications having a 10 to 20 percent energy conversion rate. In 2014, a French-German research team obtained a 46 percent efficiency record in a controlled laboratory experiment.

The year 2018 witnessed a breakthrough in solar cell energy conversion at nearly 87 percent. Years of research and billions of dollars in new affordable designs spelled the end of fossil fuels. Cars, light trucks, homes, and factories converted to a new and cheap source of energy. To complement the new solar cell, the laminar flow battery came to the market. Capable of generating three times as much power per square centimeter as current lithium-ion batteries, the automotive industry quickly seized upon the new solar and battery system to allow cars to drive almost 24 hours non-stop without the need for a battery recharge for nighttime driving. Modern electrical engines allowed large trucks and trailers to drive the highway with only the need of small electrical generators to recharge the battery for nighttime driving.

The huge advancement in new low-cost energy changed the world, but not all for good. Countries whose economy evolved with the harvesting of oil and natural gas suffered the effect of the further devaluation of oil.

Venezuela was the first country to default. An economy sustained on a crude oil price of \$70 dollars per barrel could not survive long when oil dropped to \$4.13 per barrel. Once they depleted their treasury, the government soon fell. Over the next 18 months, new Venezuela political leaders

attempted to rally the government, but all failed. Food shortages and riots soon developed. Instability quickly overflowed into neighboring Colombia and Brazil. The unrest continued south finally reaching Argentina six months after the fall of Venezuela. Unprecedented negotiations resulted in a startling new development soon to sweep around the globe. In 2020, the Association of South American Nations organized in La Paz, Bolivia with regional national headquarters in Buenos Aires, Argentina and Lima, Peru. Fourteen countries and 450 million people became one nation. The world looked at this new country, not knowing how the reorganization of the former countries of South American would be the template for their own future.

The second failure was nearly as big. Middle East oil-producing countries suddenly had no market for their only major cash-producing product. Countries like Iran, Iraq, and Syria with huge expenditure for military hardware emptied their bank reserves while waiting for the oil price to rebound. When they needed additional money, financial institutions that previously wrote open-ended checks suddenly closed their doors to the once powerful radical governments.

Once Venezuela fell, the other 11 members of OPEC soon followed with Saudi Arabia stretching their financial wealth until even they succumbed to the inevitable. In these countries, food and water now had more value than oil. The light that was once glowing in these oil-producing countries and the other developing nations in Africa went out, plunging them back into what the world again referred to as the Dark Continent.

China could not feed its 1.4 billion people as their former trading partners could manufacture their goods just as cheap now that energy costs had decreased to pre-World War II levels. North Korea's fragile economy, always dependent on the good grace of China, quickly fell. In a desperate attempt to feed his starving people, the radical government of 35-year-old Kim Jong-un invaded South Korea. The effectiveness of tactical nuclear weapons soon played their part in the short-lived military conflict. Seventy-five million people experienced a new nightmare. When the two-week war ended, there was no active national government on either side of the 38th parallel. With China, Japan, and the 10 members of ASEAN, Association of Southeast Asia Nations, reeling from the loss of their own oil income, the new country of Asia developed as they joined together to survive. Hong Kong once again became the financial capital of the new country. Less than six months into the new political and economic system, Australia and New Zealand asked to join making this the most populated country on Earth.

The European Union became the Organization of European Nations when Greece, Italy, Spain, and Portugal fell within months of each other. Britain joined the new association when the pound dropped to unacceptable levels. Greenland stayed affiliated with the Denmark government when it joined the new governmental organization. Iceland, Norway, Sweden, and Finland also followed with other Western European countries as they refused to join Russia. Nobody wanted the Russians so they stood alone to face the new world. Their own economy lay in shambles as their natural gas pipelines leading into Europe and Asia no longer carried a valuable commodity. Since Germany was the financial leader, Berlin became the new OEN capitol. The fanatics within the neo-Nazi movement hailed this as a victory, but only 100 years too late. The new government quickly moved in nationalized troops to quell the dreaded race riots started by the neo-Nazi movement. The new government worked wonders to bring stability to the country with the highest number of different ethnic background and religious beliefs.

NAFTA was the foundation used by Mexico, Canada, and the United States to become the United Nations of North America. Soon afterwards, Latin America rejected the Association of South America Nations and requested membership in the new UNNA. They pledged total cooperation and loyalty to the new central government. Washington, D.C. became the new North

America capitol city with Montrell and Mexico answering to one national leader. The huge financial strength of the United States dictated the new alliance as Mexico foundered near bankruptcy, and Canada had no market for their oil and gas. The vast croplands of the American Midwest, California, and Florida, along with the fertile land in Alberto, Canada, provided food for the 600 million inhabitants.

The world settled into the 18th year of the Solar Age with maps whose ink had barely dried. The new energy of solar power forever changed humankind in more ways than they could ever imagine.