The Energy Crisis…Again? (part I)

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"The longer you look back, the farther you can look forward," said Winston Churchill. Looking back a generation might help us predict the next quarter century. Some history really does repeat itself: Gerald Ford has returned to recent news, another Bush is in the White House, and a petroleum crisis related to Middle East tensions and semi-serious governmental focus on alternative energy sources continue. As in the 1970s and 1980s, the topics include oil shale, Alberta's tar sands, wind and solar collectors, fuel cells, methanol and ethanol to power more efficient autos, "synfuels" such as biodiesel and newly-produced methane, electric and hybrid cars, clean-coal electric generation, nuclear power, building insulation and other energy conservation. For teachers working 25 or 30 years ago, this all sounds eerily familiar. Editor John Roeder and I were among many science, technology, and social studies teachers hired by utilities and state education departments to disseminate the latest in energy education to our colleagues. Our efforts seemed to have evaporated as executive and legislative leaders re-embraced the fossil fuel vendors.

In the words of one comic, "if we are going to re-invent the wheel, let's at least make it round this time." An impediment to real progress in energy production arises from an intense affection for the familiar by both suppliers and purchasers. The US is either blessed with or cursed by stupendous amounts of coal. Deregulated companies plan to build in upcoming decades more than twice as many coal plants as now supply our growing demand. Industry spokespersons justify using conventional technology because the much cleaner and perhaps slightly costlier choices haven't been 100% proven. The 1990s cliché-of-the-decade, "new paradigm," in this millennium gave way to "thinking outside of the box." For the next decade I propose as a replacement "break-out approach" or "longer trajectory." First, we'll consider other examples of ***in***-the-box thinking versus better options. Part II will examine practical new choices available now and in the near future.

Lessons from Old Success Stories

Throughout the 20th century Texas identified itself with petroleum and natural gas plus part of the world's largest underground water supply, the Ogalalla Aquifer. However, those vast buried resources have shrunk, forcing painful changes on the economy. Farms and oil-based communities all the way into Canada have shriveled out of existence. Abandoned oil extraction relics – wooden derricks, pump jacks, blackened sumps beside listing tanks, saltwater flowing into creeks forever – litter the ruins of short-lived boom towns. Nearly identical remnants abound in Louisiana, Arkansas, Oklahoma, Kansas, New Mexico, Pennsylvania, Ohio, Kentucky, and New York.

Much uglier destruction, often described as a moonscape, marks both stripped and underground sites for coal, iron, and copper in Illinois, West Virginia, Pennsylvania, Nevada, Arizona, Wyoming, Montana, and Colorado. Manmade creeks will flow forever from tunnels always laden with corrosive acids and heavy metals. Besides open pits such as century-old Bingham Canyon in Utah—the world's largest – and New Mexico's Santa Rita – opened in 1799 by Spain – small mountain ranges of sterile tailings and furnace slag remain to blight Miami, Arizona, and other copper towns. A poisonous lake 1800 feet deep has filled in the abandoned Berkeley Pit in Butte, Montana. Millions of gallons of acidic water seep into it daily, one of the largest Superfund sites in the country. Scars from

Minnesota's Mesabi Range and three neighboring iron mines may well be visible from the moon. A hillside in Switzerland still rejects pasture grass because of Bronze Age copper smelting on that site. Re-opening of a Romanian gold mine that would bring new wealth now faces community opposition because leachate from previous mining contains so much arsenic, cadmium, lead, and nickel. That mine was begun in the 2nd century AD by order of Roman emperor Trajan.

One of the oldest and largest petroleum pollution sites pours into the East River and Atlantic via Newtown Creek along the Queens-Brooklyn border in New York City. As the nation's chief oil processing site from 1866 to 1892, it boasted 50 refineries. Most were combined into Rockefeller's Standard Oil Company. Although most operations there were closed in 1966, seepage from Standard Oil's heirs and their rivals fouls nearby water and air 140 years later. Perhaps 30 million gallons of residuals, gasoline, benzene, and other aromatics had seeped into the 55-acre plot and waterway during a century of operation. Petroleum contamination remains in groundwater, native soil, and fill material. Gasoline leaked into sewers causing a huge explosion and fire in 1950. That event still contributes to the mess which dumped 50% more petroleum than was spilled into Alaska's waters by the *Exxon Valdez*. The first hint came in 1978 when a Coast Guard patrol helicopter detected a sheen on Newtown Creek. Investigators found 17 million gallons of fluids leaking in the Greenpoint section of Brooklyn. Nine million gallons have since been removed but residents have filed a huge suit for damages stemming from the plume still lurking 40 feet under their homes. (http://www.dec.state.ny.us/website/der/projects/greenpoint/)

At least two major conclusions emerge from such experiences as listed above: [a] extractive industries must be taxed enough to allow outside agencies to restore land and water and [b] much of the damage cannot be undone.

A Look at How We Got to Where We Are: The Seduction of Coal

The nearly empty western third of Texas contains gigantic tracts of lonely, cheap land reaching far up into the Panhandle. Studies indicate they could provide all the state's electrical demand using wind and solar collectors. Some economists have proposed sacrificing the area to supply a much larger region than Texas. To now the region's energy remains largely undeveloped in part because beneath the eastern third's depressed farm regions, there exist enormous deposits of low-sulfur lignite ("brown coal"). They lie in thick, sometimes multiple seams, barely below underused grazing lands. Among the best-known facilities, Big Brown near Fairfield, Texas, scoops up the coal from huge trenches, burns it before spontaneous combustion ignites the piles, and at once returns the ash to a trough beside where it was extracted. The long windrows of subsoil and topsoil are re-contoured, irrigated, fertilized, planted with native vegetation, and stocked again with cattle. This fairly benign surface mining could continue at this rate for a century or more. Enough coal to last centuries abounds in many other parts of the North American continent, mainly in the US. Even though George W. Bush as Texas governor championed wind energy development, his national administration has abandoned conservative economic tradition by subsidizing petroleum exploration and extraction. Burning much more of the cheap, available conventional fossil fuel makes sense only if we [a] ignore downwind dumping of pollution and acid rain, plus the global warming contributions of carbon dioxide, or else [b] greatly reduce or prevent the amount of CO_2, ash, and other emissions. Promising technologies exist for the second choice, but require adequate incentives to employ them. Incidentally the much-admired late President Ford who so strongly championed American energy independence, nonetheless vetoed a mine reclamation act in 1975. He objected to taxing new surface-mined coal at 25 cents and underground coal 35 cents a ton to reclaim ruined lands. He would have been willing to accept a maximum of 10 cents. (http://www.osmre.gov/legishistory/document020575.htm)

Rewiring the Nation from Now on

Guatemalan phone service surprises foreign visitors. Lacking a copper-wire infrastructure, their telecoms by-passed the Bell era and a century later set up cell phone service that covers even remote rural mountains. Suppose we *could* skip the 20th century and go back to the Edison-Westinghouse-Insull era that first electrified urban America, and start over with current knowledge. Instead of huge dams and plants connected to eyesore high-tension towers and lines, we might choose to establish small, decentralized neighborhood plants – with a much reduced infrastructure connected to a modest grid for backup. However, we got theoretically-efficient monsters requiring disposal of prodigious amounts of heat into the air by cooling towers or into nearby bodies of water. The concept of wasted heat was overlooked in the master plan.

For new installations, we could now begin this out-of the box solution: The heat to be disposed of from very small local generators could be piped to heat hospitals, schools, industries and nearby housing spaces and domestic water. Using the absorption steam process long employed in New York City, the heat can also *cool* buildings in summer (see http://www.coned.com/sales/business/bus_steam.asp). Well-insulated buildings with solar shingles, Trombe walls, and a heat pump/air conditioner coupled to groundwater plus warmed water from the neighborhood power plant would cut heating bills and oil imports. The electric utility's main job would be to maintain the small local plants and their associated grid. Buried power lines could survive ice storms, tornadoes, and hurricanes, eliminating costly power lines and pole maintenance. A $400 backup generator for each house can power lights, refrigerator, furnace and fans in an extended emergency and can be turned on remotely by the utility. No huge surplus of expensive capacity would be needed. Structural design matters, too. Today, a sunny December 29, while a new furnace was being installed in my New York house, we needed no extra heat. This house as designed in the 1950s includes a wide overhang on our glassed-in south-facing front room. The roof shades the glass in summer, but with the sun's lower winter angle, allows enough solar gain to maintain 65°F through much of the winter.

In Part II we will consider refinements of older technology and some newer ones that hold promise.