Congress's Mission for Bankrupt Auto: Build U.S.A. Electrified Rail Network

by Richard Freeman and Hal Cooper

Congress, turning to the real tasks of the economy after disposing of Cheney's coup attempt against the Senate, is focussed on the spreading collapse of industrial workers' pension plans; the need for creation of good jobs and protection of America's infrastructure; and stopping the White House's attempt to eliminate the national passenger rail system, Amtrak. At the center of this focus of attention, should be saving the auto sector from a collapse which, if unchecked, will cost the nation its greatest industrial/machine-tool capacity. GM is heading for bankruptcy and perhaps, dismemberment, faster than policy-makers have supposed or admitted; Ford and the auto parts suppliers are not far behind.

Three possibilities exist: First, Wall Street will chop up GM and Ford into pieces and destroy their capabilities while looting their "profitability." Second, sales of SUVs and pickup trucks, as well as cars, will rebound: Falling real incomes make that infeasible, and round-the-clock traffic jams around all our major cities makes it undesirable. Third, Congress will intervene in time, before the biggest automakers collapse, and give the auto sector as a whole, credit and a chance to reorganize for a new mission. Airline and railroad routes are both shrinking to the point of threatening national disintegration. But the means for transforming the U.S. rail network are at hand—retooling the productive capacity, and re-employing the skilled workforce, of GM, Ford, and other auto-sector firms to build new economic infrastructure.

Lyndon LaRouche has called for urgent and forceful Senate action to do this.

A Transportation and Energy Policy

True high-speed rail corridors—at travelling speeds for passengers of 150 mph (250 kph) or greater, and for freight at 90-110 mph—and, as quickly as possible, magnetically levitated train systems, will upgrade the whole U.S. economy. Both have a fundamental requirement: They run exclusively on electricity. In order for high-speed rail to operate, it must have electric-powered locomotives, and overhead catenary systems to transmit the electricity to the locomotives. Yet, of America's 141,000 route-miles of rail, less than 1% is electrified. Seventy years ago, much more was, but most has been dismantled.

A national electrification program should concentrate on building and electrifying 42,000 critical rail-route miles[1], in two phases: as **Figure 1** shows, it would start with the electrification of 26,000 route-miles, and in the second phase, bring the electrification up to the full 42,000 route-miles. These route-miles are selected because they are the heart of America's rail system; they support, overwhelmingly, the greatest volume of freight and people. Although these 42,000 route-miles constitute only 29% of America's total rail route mileage, each year, they carry 65% of America's freight, and more than 70% of the intercity rail passengers.

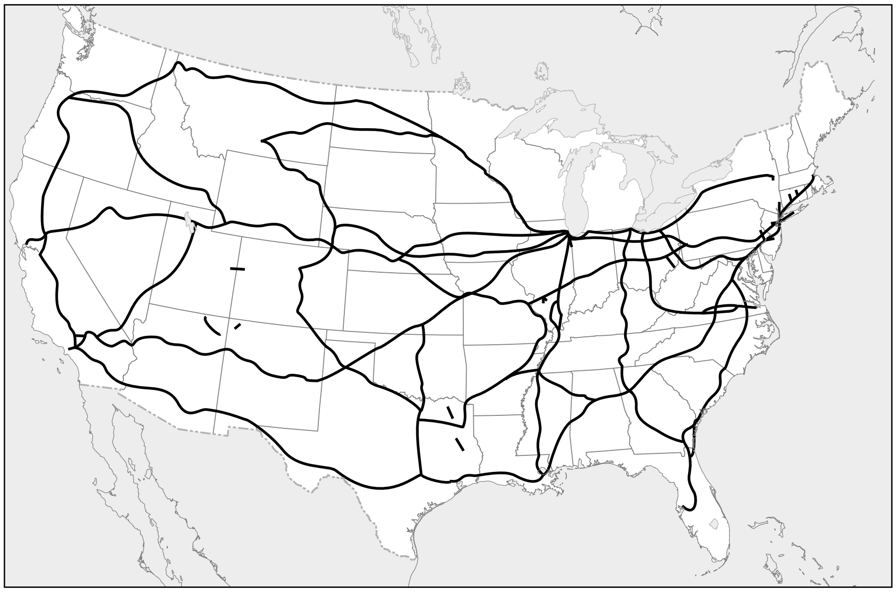
The electrification of America's rail system would require one of America's largest and most powerful "great infrastructure projects." It would shift America away from its addiction to two modes of transportation—highway and airports—100% powered by petroleum, to a more scientific system. Dependence upon automobiles and trucks leads each person to waste hundreds of hours and hundreds of dollars in traffic jams per year, which become worse as ever more trucks carrying freight take to the roads. Twelve-lane superhighways, as urged by "urban planners"—consuming greater volumes of land—are hardly a solution.

The movement to electric rail would mean that eventually up to a third of truck traffic could be shifted onto rail, and that the current rail system whose motive power is diesel-electric locomotives (which consume vast amounts of petroleum) could be shifted toward all-electric locomotives. Under advanced high-speed rail and maglev systems, *goods and people would move two to three times faster than they currently do.* Moreover, this will demand a huge increase in electricity generation. America would require mass production of nuclear power plants, and ultimately fusion power, to produce the electricity. Thus, America's transportation and energy policy would shift, in tandem, to higher efficiency and safety.

The electrification/improvement of the rail system, and the production of new power plants, through increased production at retooled auto plants, would produce a diversified array of goods from locomotives and train sets to nuclear

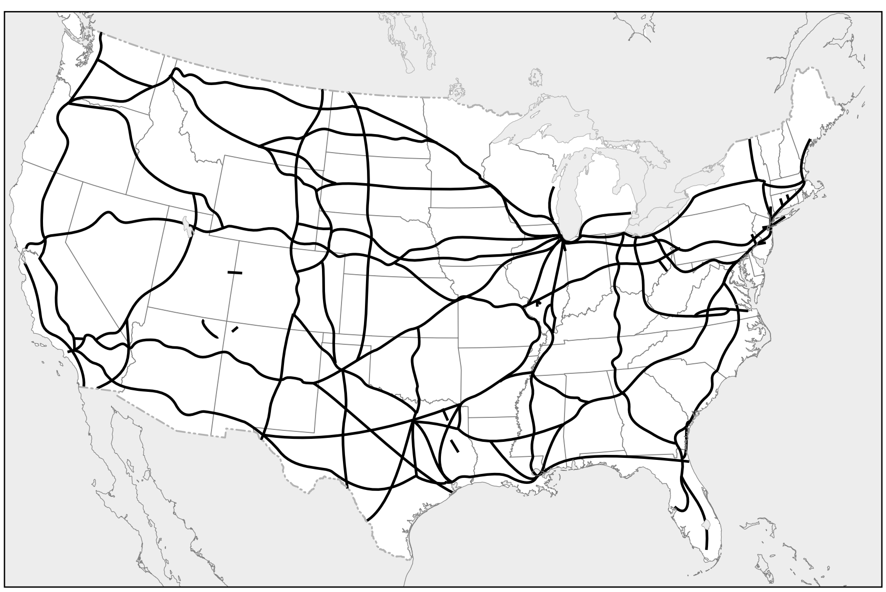
1. A route-mile is a mile of actual route that a train travels. A route of 50 miles represents 50 route-miles. This route may be double-tracked, thus having a total of 100 miles of track (and even more track in sidings, and yards), but still have only 50 route-miles.

FIGURE 1a
An Electrified U.S. Rail System: Phase I, 26,000 Miles



Sources: Hal S. Cooper, Cooper Consulting Co.; *EIR.*

FIGURE 1b
An Electrified U.S. Rail System: Phase II, 42,000 Miles



Sources: Hal S. Cooper, Cooper Consulting Co.; *EIR.*

reactor vessels, and transmission lines, employing a tremendous number of auto workers. A job multiplier would result, as each mile of rail requires 370 tons of steel, 535 tons of cement, and so on, which leads to increased new employment of workers producing the steel, cement, etc. Likewise, new jobs would be created in the actual building of the new rail systems. This entire project would employ several hundred thousand workers. It would require 15 years to construct, and cost more than half a trillion dollars, but its cost would represent but a fraction of the enhanced economic productivity it would impart back to the U.S. economy.

Importantly, as LaRouche has stressed, and we will show, the rail trunk lines represent potential, and that potential is radiated 100 miles in both directions in development corridors.

The necessity for immediate action is clear. On May 5, Standard and Poor's rating service, and on May 24, Fitch rating agency, downgraded the bonds of both GM and Ford—with $301 billion and $171 billion in debt, respectively—to "junk." In the aftermath, GM's and Ford's bonds declined, setting off enormous problems in the market for collateralized debt obligations (CDOs), and shockwaves in the world's $400 trillion derivatives market. Various hedge funds failed. The world financial system sits on the verge of *systemic* meltdown. Financier sharks, like mob-linked Kirk Kerkorian, are still pressing ahead for the dismantling of GM, and of its machine-tool capacity which America cannot live without. The time for LaRouche's proposal is now.

Superiority of Electrified Rail

The fight to electrify the American rail system has been waged for more than 100 years. The superiority of electric-driven locomotives over steam-powered locomotives and over the hybrid diesel-electric locomotives that are used today, is undeniable. We will compare electrified rail to steam-powered rail at the peak of the powers of each. This brings out the stunning superiority and method of operation of electrified rail.

The steam-powered locomotive, an invention of the 1820s and 1830s, works on the following basis. On the locomotive of the train is a "firebox" into which is fed coal. The firebox

FIGURE 2

America's Transcontinental Railroads, As Built From the Eastern Rail System After 1865

Source: *EIR.*

In 1862, President Abraham Lincoln signed the Pacific Railway Act to create a transcontinental railroad, and the U.S. government played a direct role in building it, with land grants around the road and loans of government bonds. The railroad spread industrialization and agricultural development westward. By 1893, a total of five transcontinental railroads were constructed.

heats a water boiler, making super-heated steam, which is under very high pressure. The super-heated steam is passed to cylinders (by a suitable valve arrangement), where it drives pistons. The moving pistons turn a main rod, which in turn, moves connecting rods that are attached to the locomotive's driving wheels. (This whole arrangement utilizes a system of gears.)

Five limiting features are obvious. First, the train can only achieve a certain speed. The best steam locomotives in the 1940s, using super-large cylinders, and in some models operating two parallel sets of super-large cylinders, could only achieve top speeds of 125 miles per hour, without a load of cars. Second, on a steep grade, a steam locomotive could lose as much as half of its pulling power. Third, a steam locomotive could be in the shop for as much as 40-50% of the time. Fourth, it must drag its own fuel and water supplies (for boiling into super-heated steam) along with it, usually in a "tender car." The steam locomotive must haul many tons of coal and 2,500 gallons of water or more. Fifth, the steam locomotive is inefficient: It consumes nearly two times as many BTUs of energy to carry a ton-mile of cargo freight as does an electric locomotive.

At the dawn of the 20th Century, electrification of rail had been introduced in the United States, poised to become a reality. It grew in small steps so that by the early 1930s, 3,000 route-miles had been electrified, at least several hundred of them through the decided assistance of President Franklin Roosevelt's Public Works Administration.

An indisputable advantage of electrified rail is that it does not carry its own power generator/power supply with it. The system begins with a stationary electricity generating plant far away from the locomotive, which can use any source of fuel—say, nuclear—to generate the electric power. The electricity is transmitted by transmission lines to a set of wire lines that hang overhead of the train track, called the catenary lines. A device on top of the locomotive—called a pantograph—makes continuous contact with the catenary system, transmitting electricity continuously into the locomotive. (A transformer steps down the voltage). The electricity is directed to motors which are attached to the wheels, and power them.

The electrified train system produces benefits of great significance: First, one leading system, the French TGV, cruises at 180 mph (290 kph), a speed closely approximated by electrified systems in several other European nations and Japan. Second, the electrified train system uses no petroleum. Third, several electrified trains can use "regenerative braking systems" (by essentially transforming the motors into generators) which capture electricity when braking, and save great wear and tear on brake shoes, etc. Fourth, the electrified train uses half as many BTUs to carry a ton-mile of cargo freight as do steam powered locomotives, and maintains a sizeable energy efficiency over other transport systems.

The close of World War II marked the end of the dominance of steam-powered locomotives—a demise that should have come a half-century earlier. Certainly, the bright prospect of the U.S. moving toward electrified rail was beckoning. But this move never occurred, sabotaged by Wall Street banking interests.

Post-World War II Highway Initiative

In the period after World War II, an alliance of the Anglo-American bankers, the oil cartel, and the Morgan/Dupont-controlled General Motors organized to stop cold, the electrification of U.S. rail. First, they worked to pass the Interstate and Defense Highways Act of 1956. Ostensibly the product of a Presidential task force on this subject headed by General Lucius Clay, the Act was to provide a centralized series of corridors for the continental movement of goods during war and other emergencies. However, the above alliance shaped it to spread suburban sprawl, suburban real estate bonanzas, and the explosive growth of the petroleum-consuming car and truck market, which came to dominate the nation's transportation system.

The Act created an enormous annual flow of government money into highway building, so that during the past 50 years, $2.5 trillion has streamed into building and repair of U.S. highways and roads, while Amtrak must beg to get a paltry $1.8 billion per year to barely survive. In 2004, some 8.75 million trucks were turned loose on the highways, carrying 25,000-100,000 pound loads. The heavier the trucks become, the more they rip up the highways—as the damage increases geometrically with heavier trucks—requiring greater repair. The surge in truck traffic in particular, and also passenger cars, has grown to such unwieldy proportions, that for hours of each day the highways don't function. Various urban planners now propose building highways with six lanes in each direction.

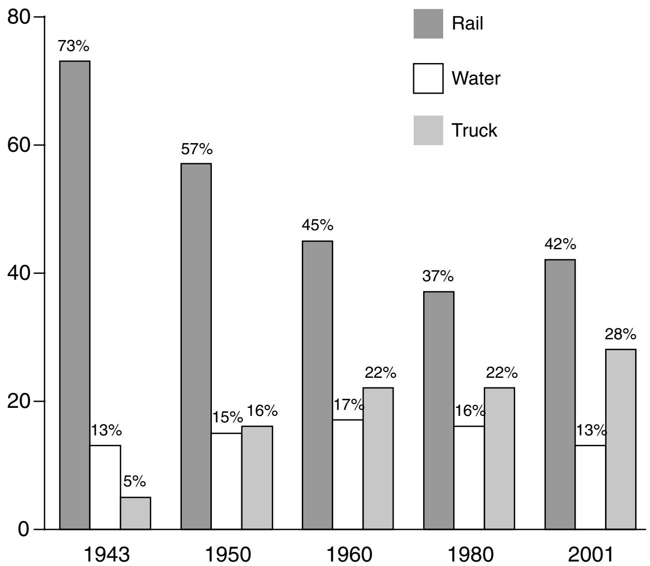
Figure 3 shows the result of this process, which is a degradation of the U.S. transportation system's functioning. In 1943, during World War II, 73% of America's intercity freight traffic travelled by rail, and only 5% travelled by truck, and the system worked. By 2001, the percentage of freight moved by rail plummeted to 42%, while truck freight rose to 28%. Were one not to count the coal moved by the railroads, trucks today carry more goods.

The bank-oil cartel-automotive alliance carried out a second assault in the post-World War II era. They dismantled much of the electrified rail that existed, leaving less than 1,000 electrified miles in America. As steam-powered locomotives were phased out, they shifted toward diesel-electric hybrid locomotives, which now comprise 99% of the U.S. fleet. Of the several points that could be made about diesel-electric locomotives, two are most important. First, think of putting a diesel engine onboard just to power a generator for an electric locomotive. This could be done simply, without the diesel engine, through transmitting outside electricity into the locomotive. Second, consider that a diesel-electric locomotive has a 450-500-gallon diesel fuel tank. Collectively, these hybrid locomotives consume 3.8 trillion gallons of fuel per year.

FIGURE 3

Share of Domestic Inter-City Freight Traffic, by Mode of Transport

(Percent)



Sources: U.S. Dept. of Commerce; *EIR*.

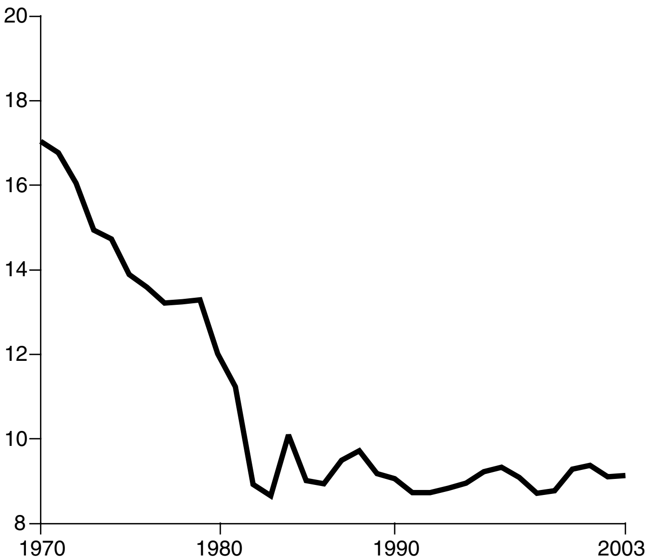
Thus, one has reduced an electric locomotive to an appendage of the burning of petroleum.

In addition to the technological degradation of the rail system, has been its physical dissolution, especially after the Staggers Act of 1980 deregulated the industry, and the sharks and asset-strippers moved in. There was a ferocious "rationalization" of rail lines. Whereas in 1980, Class I railroads operated 164,822 route miles, that was taken down by 40% by 2004, to 99,000 route-miles. In the same period, the railroads settled on a survival strategy: Loading up on the transportation of coal. Coal is a legitimate fuel source for electricity generation, but its role and use should not be exaggerated. In 2004, 43% of all tons shipped on the rail system were coal. This ties down the rail system. The transport of other goods is lagging. **Figure 4** shows that over the past three decades, the rail industry's shipment of non-coal goods, per household, has fallen dramatically.

Building a Great Project

The long-suppressed electrification of America's dilapidated rail system is an undertaking which could only be achieved by the fight for and adoption of LaRouche's April 13 emergency proposal to the Senate, because that would retool the auto sector to deploy the immense volume of advanced machine tools and hundreds of thousands of skilled workers it still commands, to produce the goods for the electri-

FIGURE 4
U.S. Railroads' Shipping of Goods Other Than Coal, Tons per Household per Year



Sources: American Association of Railroads; *EIR*.

fication infrastructure.

We present the crucial elements, which, being done in tandem, put great demands on the economy. Consider the tremendous array of goods, through the bill of materials, that would go into each element.

1. **Electric Locomotives:** In 2003, the Class I railroads (the nation's largest railroads)[2] operated 20,711 locomotives, all of them diesel-electric. About half these locomotives travel on the most heavily travelled 42,000 route-miles cited above, or 10,350 locomotives. An attempt could be made to retrofit the diesel-electric locomotives into all-electric locomotives, but that is a complicated procedure. Thus, the retooled auto plants would have to take the lead in building 10,350 all-electric locomotives.

2. **Catenary lines and transmission lines:** To electrify these routes, an overhanging system of catenary lines would have to be built above the tracks, to transmit the power to the trains. From electric power plants, electricity would be carried by transmission lines to the catenary lines. This means 42,000 miles of catenaries, and tens of thousands of miles of transmission lines.

3. **Substations:** These bring power from high-voltage levels to lower voltages, and also act as phase-breakers, because when current travels more than 40 miles, there are severe voltage losses. The substations, more than 1,000 of them, would be built every 40 miles.

4. **Double-tracking:** When along a specific route, trains coming from opposite directions share the same track, both must slow down at some point, using a side track to clear one another. If that happens several times on a route, the overall trip speed is considerably slowed. A double-tracked route provides a set of tracks for going in each direction. Of the 42,000 route-miles selected for electrification, only 10-12,000 are double-tracked, but heavy usage makes virtually all of them candidates for double-tracking, calling for tens of thousands of miles of new track. There exists a bill of materials to lay each new mile of track: 370 tons of steel, 535 tons of cement, etc. As well, steel is required for the culverts.

5. **Nuclear Power Generating Plants.** The 42,000 route-miles of electrification would require a complete overhaul of America's energy policy: Its inadequate energy grid now suffers blackouts and shortages. To electrify these route-miles would require adding new electric generating capacity of 50,000 megawatts (MW), that would generate 383 trillion kilowatt-hours of electricity during the course of one year. This would represent a 5.3% increase of the United States' installed (Summer) generating capacity.

To do this, the U.S. would have but one choice: to move forward with a vigorous nuclear energy policy. Let us assume that the new 50,000 megawatts added capacity were to be produced by building new nuclear power plants. A fourth generation reactor could be a 800 MW nuclear plant, consisting of four high-temperature gas-cooled reactor (HTGR) units of 200 MW each.[3] To construct the added 50,000 MW in generating capacity, it would be necessary to build 63 nuclear plants of 800 MW, which is to say, 252 units of 200 MW. This cries out for mass production techniques for nuclear power production. Retooled auto plants could make several of the components.

We have briefly examined five elements that are indispensable for the electrification of America's rail system. Needless to say, there are many more elements of importance that could be considered: signalling systems; grade separations (underpasses and overpasses to cross the track); passenger cars, hopper cars, and intermodal cars; train stations; components such as couplers, cooling systems, etc.

The most important thing is getting physical production geared up to produce the critical features of this great infrastructure project. Its production will employ at minimum 250,000 workers, most of them skilled, in producing the array of goods from the final locomotives and transmission lines, to the semi-finished goods like steel, copper, and aluminum, and the components like cooling systems, to the

2. Class I railroads—A Class I railroad has $277 million or more of revenues per year. In practice, each of America's Class I railroads has more than 10,000 miles of track.

3. Another arrangement could be a 1,140 MW nuclear plant, consisting of four GT-MHR units of 285 MW each.

High-speed railroad travel and freight requires electric-powered locomotives, whose mounted pantograph devices pull power from overhead lines. This means construction of new power facilities, substations, and transmission lines, as well as rail, because the United States has lost virtually all the electrified rail mileage it once had.

final on-site construction. There is a price attached to each element; for example, the cost of an electric locomotive is about $3.5 million, so that 10,000 such locomotives would cost $35 billion. Preliminary projections are that the whole project would cost in the range of $400-500 billion, and take 10-15 years.

However, the system will permit the economy to leap-frog ahead technologically. Electrified high-speed rail passenger travel will occur at 150-190 mph; freight will travel at approximately 90-110 mph (for safety's sake, coal and a few other commodities are best served travelling at lower speeds). By contrast, 75 mph is the legal limit of passenger cars and freight-carrying trucks, and in reality, in traffic, they travel at a fraction of that speed. The electrified system will radiate these benefits, and the associated higher productivity, through the main corridors of every part of the nation.

Given the speed and other advantages of electrified rail,[4] it will be possible to take trucks off the road in two ways. First, there are categories of freight that are best shipped by rail. Second, in a process that is in its infancy: trucks can do short-haul. A truck picks up a product, drives to a railroad, is strapped onto a rail flat car, and shipped to another city, where the driver and truck disembark to make the delivery. By these two processes, within 15 years, one-third of truck traffic could be shifted to rail.

However, the production of goods for electrification of 42,000 rail route-miles cited above, is based on working to accommodate the current volume of rail freight, and factor in a small annual increment. Were we to succeed in transferring one-third of truck freight to rail, this would require a *second round* of increased production for electrified rail.

Magnetic Levitation

As forceful as the effect that rail electrification would have in transforming the economy, there is still a higher level: magnetic levitation. In "maglev," the magnetic forces generated by the interaction between the bottom of the transport vehicle and the rail, lift, propel, and guide a vehicle along a guideway, so that it "flies" on a magnetic cushion. This eliminates wheel-on-wheel friction, which slows all traditional modes of railroad transport. Current generation maglev systems cruise at speeds of 245 mph (392 kph), and can reach top speed of 300 mph (492 kph), four times the current average speed of U.S. freight and passenger travel.

Maglev would start in the 5,000 miles of corridors that are the most densely populated. It would require a *third round* of rail production gear-up, including an additional 25,000-50,000 gigawatts of nuclear generating capacity, meaning that with electrification and maglev, the nation's generating capacity would have to increase an impressive 10%. A national maglev rail system would cost a quarter of a trillion dollars.

Railroad electrification, including maglev, becomes possible only when the economy is mobilized and the mammoth production capability represented by the retooled auto sector, is brought into play. Without this capability, electrification of this scope would not be possible.

Such a mission will emerge from a political fight. Adoption of LaRouche's emergency proposal would save the auto sector in precisely such a manner, as to generate a technological revolution in rail and cascading productivity that will aid in reconstructing the nation.

4. A truck consumes nearly 2.5 times as many BTUs of energy to carry a ton-mile of cargo freight, as does an electric locomotive.