# Automobile Use Policy: It's Time to Integrate

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*U.S. energy policy on automobile use must move beyond fuel efficiency and recognize that energy, economics, and transportation issues are tightly intertwined.*

The debate over U.S. energy policy uniquely demonstrates the complexity of developing public policy to tackle a serious issue. In forming such policies, it is critical to consider a range of issues, yet it is common for initiatives to take a single focus. Initiatives to address automobile oil consumption, for example, have introduced hybrid, electric, and alternative-fuel vehicles, yet fail to consider the inherent cost of delivering a new fuel technology or the attendant environmental concerns. This one-track obsession with fuel efficiency ignores opportunities to tackle other facets of the oil consumption problem. Driving fewer miles, for example, would also conserve energy and might mitigate environmental problems, such as greenhouse gas emissions from carbon dioxide.

Indeed, automobile use is an excellent example of why a better strategy is to develop energy policy in concert with policy areas such as transportation and economics. Only then can policy makers see that fuel efficiency is only one facet of a many-sided problem. More important, to ignore issues in these other policy areas is to ignore opportunities to exploit the symbiotic relationship of such issues. If the aim is to reduce miles driven, the solution should not merely be to raise the cost of driving in the hope of getting motorists to creatively address the driving trend. Rather, a sensible policy that integrates energy, transportation, and economic concerns should be the basis for imposing a societal cost. Blunt force approaches that target only fuel efficiency gains or gas prices or even alternative fuels, ignore the negative effects of automobile use that are independent of energy consumption.

At present, traditional energy policy seems almost set apart from policies in

## Inside Track

- Current U.S. energy policy on oil consumption, the CAFÉ standards, has not been effective in reducing foreign oil dependence.
- The gasoline tax, also part of current energy policy, generates revenue, but it is a blunt instrument for reducing congestion. It taxes at the same rate, regardless of time, place, or demand.
- Congestion pricing, a transportation policy in limited use throughout the United States, not only helps mitigate congestion, but is also a more equitable way to fund transportation infrastructure.
- Pigouvian taxes, albeit a contentious economic policy, could be a tool to account for the environmental impacts associated with consuming energy for automobile use.

transportation and economics, and this should not be. A retrospective look at these isolated policies shows missed opportunities to address issues in a way that would most benefit all three areas. Future policy-making must become more integrated so that these opportunities are not lost once again.

## The big picture

As the sidebar "The Oil Consumption Problem" explains, the effects of even a narrow problem like automobile oil consumption gives rise to complex interrelationships. A look at automobile use in general, as in Figure 1, reveals ramifications to transportation and economic policy that are not always dependent on energy use. A policy directed solely at oil consumption and the desire to reduce our dependence on foreign oil sources impacts other policy areas as well. For example, without an economic reason, current policies that aim to make vehicles more energy efficient enable consumers to drive more miles while paying the same cost. This has an impact on transportation (increased congestion). Likewise, if consumers do not drive as many miles, the revenue to fund transportation infrastructure decreases, since not as many people are paying gas taxes. Thus, energy policy is only one component of a much larger policy area surrounding automobile use.

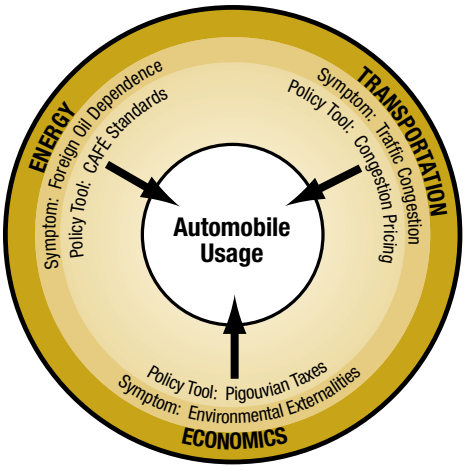


Figure 1. Relationships among key policy areas in the context of automobile use. Each area gives an example of a current policy that addresses some aspect of automobile use (symptom) that policy makers have previously considered in isolation. As the arrows show, however, key interrelationships exist that can influence policy and that require an integrated policy-making approach.

### The Oil Consumption Problem

Public policy issues are defined by three criteria: Is it a public concern? Will there be an impact on society as a whole? Do people disagree over it? The oil consumption problem, as it relates to automobile use, meets all these criteria.

Both state and federal elected leaders are developing legislation to require vehicles that are more fuel efficient. Consumers are asking government to reduce gasoline cost either by temporarily reducing the gasoline tax or by issuing tax rebates. Vehicle manufacturers and academics are asking for a larger federal commitment to research funding for alternative fuel development.

Unfortunately, none of these requests in isolation will produce an effective energy policy. The energy policy debate has expanded to include areas that countries have traditionally addressed in isolation: transportation, environment, national security, and the economy. Policy makers are rapidly realizing that policy to reduce the impact of oil consumption is not as simple as requiring manufacturers to make vehicles with greater fuel efficiency, decreasing the gasoline tax, or even allocating more funding for alternative fuel development.

### Energy policy

Renewed concern over dependence on foreign oil sources is one reason that energy policy is at the forefront of the public policy debate, and many energy policies have attempted to address this reliance. Foremost among them is the Corporate Average Fuel Economy (CAFÉ) standards, which aim to increase automobile fuel efficiency, since automobiles are the largest consumer of petroleum products.

Congress enacted the CAFÉ standards as part of the Energy Policy and Conservation Act of 1975 with bipartisan acceptance. The enactment occurred around the time of the OPEC oil embargo, when gasoline prices fluctuated between 72 cents a gallon in 1973 to $2.04 in 1981 and back to $1.20 in 1985 (2005 dollars).[1]

To comply with the standards, a corporate fleet of passenger cars had to steadily increase the average fuel economy from 14 miles per gallon (mpg) in 1974 to 27.5 mpg by 1985.[2] A separate CAFÉ standard for light trucks and SUVs (which were considered part of the light truck category) was set at 20.7 mpg.

In 2005, the impact of Hurricanes Katrina and Rita refocused attention on foreign oil dependence, creating a window of opportunity for Congress to consider revising the CAFÉ standards. According to data from 2005, U.S. oil refiners used 20.66 million barrels per day of which 67 percent (13.83 million barrels per day) was imported.[3] Of this, 44 percent was used solely for gasoline. Recognizing automobile oil consumption as the main contributor to U.S. dependence on foreign oil, in his *2007 State of the Union Address*, President George Bush proposed the goal of reducing U.S. gasoline use by 20 percent in the next decade. The method of reduction was to combine the use of renewable and alternative fuels with the reforming and modernizing of the CAFÉ standards.[4] Congress has since passed, and the president has signed, the Energy Independence and Security Act of 2007, which increases the standard by roughly 40 percent to 35 mpg.[5]

### Transportation policy

Transportation policy's current target is traffic congestion, and one of the key strategies to combat it is congestion pricing—a mechanism for charging users a fee based on the current traffic level. As the sidebar "Congestion Pricing Systems" describes, the most basic type of congestion pricing essentially draws a perimeter around the city and charges each vehicle a fee for crossing the boundary. Technology can improve this basic plan by allowing a vehicle-based system that uses a global positioning system and other vehicle identification and tracking technologies. The system would then charge users according to their location and the time of day. Congestion pricing variations include toll roads, high-occupancy toll (HOT) lanes, and user fees.

**Toll roads.** Although often used to fund the infrastructure, many toll roads create revenue far beyond that needed for facility maintenance and operation. Most new toll

## Congestion Pricing Systems

William Vickrey first proposed the idea of congestion pricing for the New York City subway system in 1952, recommending that fares be increased in peak times and in high-traffic sections and lowered in others. Unfortunately, he had neither political nor technical support for his idea.

Twenty-four years later, one of the first U.S. implementations of congestion pricing was implemented for the Washington, DC, Metrorail, which also uses distance-based pricing.[1] In fact, Metrorail considered implementing a station-based congestion pricing scheme for the fiscal year 2008 budget to better manage passenger demand at its most heavily used stations along the orange/blue lines in Northwest Washington, DC.[2]

In London, a congestion pricing system has been in effect since February 2003. All motorists entering the designated area between 7:00 am and 6:30 pm must pay a fee. Exceptions include taxis, motorcycles, and vehicles using alternative fuels. Motorists pay daily, weekly, or monthly through vending machines or the Internet. A system of video cameras matches license plate numbers with those who purchased a pass. Violation fines can be as much as £120.[3]

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roads, among them the Dulles Greenway in Virginia, incorporate congestion pricing by reducing tolls during off-peak periods. Technology enhances the system by enabling wireless toll tags, which toll road authorities can use to adjust price according to demand. The goal is to maximize the chance of a congestion-free trip as well as to reduce toll booth bottleneck.

**High-occupancy toll lanes.** With HOT lanes, vehicles meeting the carpool requirement travel free; those who don't meet the requirement pay a fee. Thus, HOT lanes are essentially a hybrid of traditional toll and carpool facilities, attempting to maximize both roadway capacity and revenue generation.

**User fees.** User fees support the transportation infrastructure. Public transportation systems typically charge users a fee for a parking space for a given duration. User fees are not commonly used in the United States for transportation systems, but many European cities have implemented simplified user fee structures to mitigate congestion. London motorists, for example, are charged each time they enter a certain section of the city.

### Economic policy

The main economic policy related to automobile use is the gas tax, the merits of which academics, policy analysts, and the press have been hotly debating. As a revenue-collection device, the U.S. tax falls short of its Western European counterpart, and many U.S. policy makers are calling for increased rates. Proponents of increased tax argue that, unless gasoline demand is completely inelastic, any tax will reduce the demand. Moreover, they add, the current gasoline tax does not cover the negative externalities of gasoline use, such as traffic congestion. A higher tax might account for those externalities and overall lead to more rational and efficient gasoline use.

Within the context of this argument are two kinds of costs: the marginal private cost (MPC), which is what a producer pays, and the marginal social cost (MSC), which is the sum of MPC and the marginal damage (MD) that results from production. For gasoline use, the MD is the pollution emitted from use. Because that pollution is not part of the MPC, the gasoline producer is free to produce inefficiently because the cost of doing so is absorbed in social cost. Figure 2 shows this relationship.

The first to recognize the problem of producers and consumers not accounting for MD was economist Arthur Pigou. In *Wealth and Welfare* (Macmillan, 1912), Pigou recognized that production's external costs were not included in production decisions and offered a simple solution: Apply a tax, equal to the cost of MD, to each unit of a polluter's output. This tax, would then lower output until production equals the marginal social benefit. The solution, which became known as the Pigouvian tax, is now part of economic policy.

This concept has direct relevance to energy policy and gasoline consumption. In this context, the Pigouvian tax is the gaso-

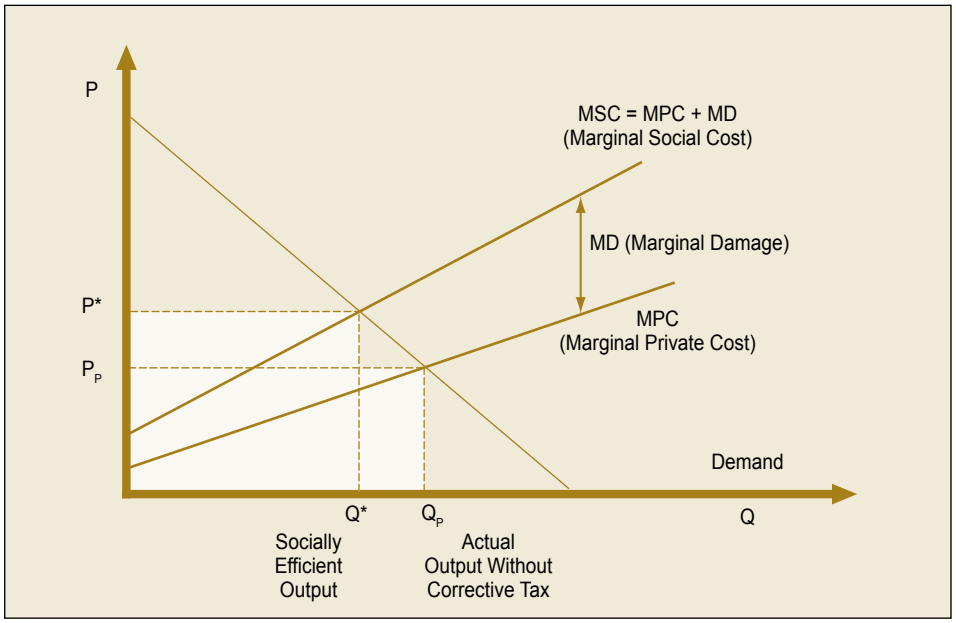


Figure 2. The relationship between demand, production, and societal cost. Pigouvian taxes attempt to have the producer absorb the marginal damage (MD) of production. In terms of automobile use, the producer is the driver, and MD cost reflects the externalities associated with driving. The Pigouvian tax is the gasoline tax, which must be high enough to account for the MD of driving resulting in the marginal social cost (MSC). Thus, the MSC creates a new equilibrium point where P* and Q* intersect as the most socially efficient output in terms of automobile use.

line tax, and the producers are the automobile owners. Following Pigou's reasoning, the MD associated with driving should be priced into the cost motorists pay at the pump, rather than being borne by society. By not paying the full costs associated with driving, consumers are likely to drive farther or to drive vehicles that are less fuel efficient than if they bore the full costs. In a sense, overreliance on driving becomes a "bad" product, and traditionally, as the sidebar "How Can Taxes Help?" describes, consumers have had to pay for the use of such products.

One immediate problem with a Pigouvian tax is that calculating the marginal damage associated with gasoline use and driving is not as easy as it sounds. No reliable estimates exist, and raising the gasoline tax too high could lead to less pollution than is socially acceptable. That is, drivers would have to drive less to such a degree that it would affect society. Nonetheless, some economists believe a tax of one dollar would adequately cover the externalities associated with U.S. gasoline consumption.

## Integrated policy tools

Each of these key policies—CAFÉ standards, congestion pricing, and Pigouvian taxes—comes with its own set of strengths and weaknesses that contribute or detract from an integrated energy policy.

### CAFÉ standards

Some policy makers debate the effectiveness of CAFÉ standards, but most of the controversy is outside the narrow issue of fuel economy, which was the standards' original focus. Opponents argue that 27.5 mpg is an artificial mark, and if the market had been left unregulated, it might have developed even more fuel efficient or alternative-fuel vehicles.[6] According to these policy experts, CAFÉ standards negatively affected automobile fuel economy because they did not account for economic or market forces.

Thus, although CAFÉ standards were clearly effective within their narrowly defined original policy objective of increasing corporate average fuel economy, they were less effective than perhaps they might have been had they addressed environmental, national security, and economic policy issues.

Indeed, policy experts debate many aspects of the CAFÉ standards, such as its effectiveness in reducing foreign oil dependence and decreasing the environmental impact of automobile use, its influence on the consumer's vehicle choice, its contribution to the rise of suburbia, and its effect on transportation infrastructure funding.

**Foreign oil dependence.** In one sense, CAFÉ standards have failed, since foreign oil imports have increased each year since the 1970s oil embargo. Proponents counter this by asserting that, without the standards, the United States would now be relying even more on foreign oil. On balance, they argue, CAFÉ standards in and of themselves did not increase U.S. dependence on foreign oil.

**Environmental impact.** Proponents of the CAFÉ standards argue that without the standards, the environmental crisis, particularly greenhouse gas emissions, would be much greater today. However, according to the Office of Technology Assessment, a 40 percent increase in CAFÉ standards would reduce greenhouse emissions by only about 0.5 percent, even under the most optimistic assumptions. Moreover, cars and light trucks subject to fuel economy standards make up only 1.5 percent of all global human-produced greenhouse gas emissions.[7]

On balance, opponents argue, as an environmental policy, the standards have not been as effective as they could have been because they haven't been adjusted in years. Moreover, the lower standard for light trucks and SUVs didn't help and could even have been a factor in making those vehicle types increasingly popular.

**Consumer choice.** Economists and other supporters of free markets argue that the market should dictate what vehicle type consumers want to purchase. If gasoline prices are high, consumers will logically desire models with greater fuel efficiency. Likewise, if gasoline prices are low, consumers might choose larger vehicles with more horsepower.

In setting the CAFÉ standards, Congress essentially dictated the vehicle types that would be manufactured and in so doing removed some of the market forces. The loophole was the classification of the SUV as a light truck, which meant that it could meet the less stringent 20.7 mpg instead of the 27.5 mpg. Arguably, this led to the rise and dominance of the SUV in the late 1990s. In some sense, then, consumer choice and free markets overrode or at least counteracted the narrowly defined CAFÉ standards.

**Rise of surburbia.** Some evidence suggests that weak CAFÉ standards combined with relatively cheap gasoline contributed to the growth of suburbia in major U.S. cities. Vehicles with increased fuel efficiency let drivers consume the same amount of gas, even with longer commutes. Since CAFÉ standards did not account for the environmental and economic externalities associated with driving, such as environmental damage and congestion, consumers could spend the same on driving but own a home

### How Can Taxes Help?

Economists have long recognized that not all economic transactions result in socially beneficial outcomes. For example, activities like prostitution and the consumption of certain drugs are recognized as harmful and are for the most part illegal in the United States. In less extreme cases, society might wish to limit the consumption of certain goods by imposing taxes. Traditionally, taxes are on "bad" products—those with negative health effects—including alcohol and cigarettes.

In a similar manner, pollution and other undesirable externalities can be reduced with taxation. Such taxes are known as green taxes because they help the environment while raising revenue. Taxing carbon emissions from power plants and other sources is one way to slow global warming. Standard economic theory suggests that higher taxes will raise production cost and hence reduce output, thereby improving the environment.

Green taxes have two main benefits. First, they help price goods and services correctly and reduce pollution and other negative externalities. Second, the revenue raised from taxing a bad product can be used to finance government activities or to reduce taxes on good activities like working and saving. Thus, a gasoline tax might come with an offset in income tax.

further out. Again, as an energy policy, CAFÉ did not account for environmental and economic consequences.

**Transportation infrastructure funding.** Currently, transportation infrastructure is funded primarily through the tax levied on each gallon of gas consumed both statewide and nationally. In the past, vehicle miles driven have outpaced the increase in fuel efficiency, which is why gas tax revenues have not decreased. However, a significant increase in CAFÉ standards might have a negative impact on gas tax revenues at both the federal and state levels. A 2003 Congressional Budget Office study indicated that the least expensive method to reduce gasoline consumption by 10 percent would be through a gas tax increase, not higher CAFÉ standards.[2] Thus, to some extent, the policy goal of raising fuel efficiency conflicts with the goal of sustaining transportation funding.

**Change the standards?** CAFÉ standards are perhaps the most visible aspect of U.S. energy policy to ordinary consumers, but they may not be the most effective in addressing oil dependence and consumption. Raising CAFÉ standards is likely to increase vehicle fuel efficiency, but it is not certain how consumers will respond. As history demonstrates, increased fuel efficiency without a commensurate rise in gasoline cost enabled consumers to drive more without a cost penalty. Thus, a more effective approach would be to coordinate new vehicle efficiency standards with a transportation and economic policy that addresses traffic congestion and transportation funding—both unintended consequences of the original CAFÉ standards. If Congress is going to consider changing the CAFÉ standards, it must understand these consequences and consider alternative methods for dealing with them.

### Congestion pricing

The primary intent of congestion pricing in all its forms is to mitigate the effects of excessive demand on the roadway infrastructure. Support for congestion pricing has increased as policy makers realize that CAFÉ standards and the gasoline tax have negatively affected other policy goals such as energy dependence. As mentioned earlier, the cheap price of gas and the blinkered focus on fuel efficiency may have inadvertently increased vehicle mileage trends because the cost of driving is so low.

Congestion pricing effectively addresses gasoline consumption—a key aspect of current energy policy. Congestion wastes fuel: A driver going 5 mph in stop-and-go traffic is not getting 30 mpg in *any* vehicle type. It is also a more direct approach to charging motorists than indirect methods such as the gasoline tax, which some argue prevents users from paying the full costs of impacts from their driving, particularly when travel demand is high. Congestion pricing, in contrast, gives drivers an incentive (lower cost) to drive at off-peak times or to avoid congested areas.

*Congestion pricing can complement or replace existing taxes. A built-in universal user fee could cover the costs to address the pollution that results from driving.*

If charged appropriately, users will respond more readily to a direct tax like a congestion or per-mile (toll) fee, rather than an indirect tax, such as the gasoline tax. The gasoline tax is an effective policy for generating revenue but a blunt instrument for reducing congestion because it taxes at the same rate, regardless of time, place, or demand. Thus, the appeal of implementing congestion pricing (or one of its cousins) is that the fees can be set just high enough to cover the infrastructure cost, or higher still to address the negative externalities of driving. Congestion pricing can also complement, or be used in lieu of, existing taxes. It is feasible to build user fees into a congestion pricing scheme as a minimum cost that all drivers must pay. This fee could include the costs of pollution and other negative externalities from driving.

In the near future, 5.9 GHz dedicated short-range communications and global positioning systems will transform congestion pricing. These technologies will allow a transparent implementation of congestion pricing schemes, which will pave the way for new services, new business models for service delivery, and new ways to fund the transportation infrastructure.

### Pigouvian taxes

As mentioned earlier, the idea behind the Pigouvian tax—in this case, the gasoline tax—is to force drivers to pay for the impact of their automobile use. Direct environmental impacts include pollution (both atmospheric and noise) and dependence on foreign oil sources. Indirect impacts include congestion and accidents.

**Pollution.** Gasoline burning emits several pollutants, among them carbon dioxide, a cause of global warming. Locally, gasoline emissions lead to smog, erode health, and threaten local ecosystems. The negative environmental impacts associated with heavy automobile reliance have been gaining more attention, particularly the consequences of tailpipe emissions which increase with traffic congestion.

**Foreign oil dependence.** U.S. dependence on foreign oil also results in the national security cost associated with protecting oil production and shipping and minimizing the disruptive effects of supply shocks. Presumably, if drivers had to pay the full cost at the pump, they would drive less or drive cars with better fuel efficiency, thereby reducing U.S. dependence on these producers.

**Congestion.** Drivers pay a cost in lost time when stuck in traffic. Low gas prices enable people to live farther away from their work and to drive more, or to take more trips than they would if gas prices were higher. On the other hand, congestion would still be a problem even if all cars had zero emissions and were solar-energy-powered. Although not the sole factor, congestion is certainly an indirect cost of gasoline con-

sumption. Higher gas prices might encourage consumers to combine some trips and to reduce total vehicle miles.

**Accidents.** Accidents are a direct result of drivers on the road, and if gas is cheap, it is reasonable to expect more drivers. If the roads are congested, accidents are less serious because traffic is so slow. However, when speed is normal (at the posted limit), each additional driver increases the other drivers' risk of an accident.

## Putting it together

As the previous section illustrates, the three policies described have important implications for one another. CAFÉ standards are an example of an energy policy for mitigating a negative effect of automobile use—reliance on foreign oil sources. But the standards both positively and negatively affect policy in other areas: On the up side, reduced emissions positively affect the environment; on the down side, increased vehicle use (an unintended consequence) demands higher tax revenue to fund the transportation infrastructure.

Congestion pricing generates tax revenue to fund the transportation infrastructure and reduces travel demand—both positive impacts. More important, congestion pricing is an example of integrated policy that addresses transportation, economic, and environmental issues: It affects transportation demand *and* can be used as an alternative funding mechanism *and* has a positive environmental impact.

Pigouvian taxes are an example of how to use economic policy to account for the environmental externalities of production. In the context of automobile use, the gasoline tax is a way to force drivers to pay for the impacts to society of their automobile use.

An example of the interdependence of these policies is evident in recent developments in Virginia. At one time, hybrid vehicles were allowed in carpool lanes even if they did not meet carpool occupancy requirements. Increased congestion from these vehicles soon put an end to that policy. Thus, the role of energy policy in affecting gasoline consumption (and foreign oil dependence) may be quite small compared to the role of other policy areas, such as economic (Pigouvian taxes) and transportation policies (congestion pricing).

Coherent and effective public policy recognizes the inherent links among policy areas. At a minimum, an effective automobile use policy will likely combine congestion pricing with stricter emissions standards, subsidies for public transport, and funding for alternative fuels research. The CAFÉ standards were adequate policy for their day, but that day is long past. Current times demand an energy policy that accounts for economic, transportation, and environmental impacts. This retrospective of past policies has shown the value of integration by highlighting the consequences of omission. It is time to act on those lessons and create an energy policy with a more encompassing approach to the diversity of issues. ❖

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Noblis and George Mason University recently announced the formation of the Center for Network-Based Systems, the first-ever center dedicated to improving the performance, economics, and resilience of complex systems based on networks. The Center will conduct research focused on the practical challenges faced by planned and implemented complex systems that increasingly employ networks as a central architectural component. Further information and initial results may be viewed at www.noblis.org/cnbs/.