

Infrastructure in Washington: Growth and Change

THE BOTTOM LINE

We urgently need investments in infrastructure in the state right now, and investments we make today have a lifespan measured in decades. In building facilities today we cannot ignore all the possible changes to the way we use water, energy and transportation infrastructure in the state, yet we cannot wait around to figure out which of those possible

After years of hard work, we are finally seeing major progress in building and maintaining infrastructure in Washington. A whole host of highway projects are underway across the state, municipal water systems are catching up with growth, and electric utilities have returned to normal. So this should be a time of fulfilling promises to voters and ratepayers.

But just when it seemed safe to get out the big machinery and get to work, a whole list of new issues appears on the horizon.

This brief begins by outlining some of the forces that will compel agencies to rethink their plans, and the constraints they face in responding to those forces. The second half of the paper reviews current issues faced by providers of transportation, electric power and water.

CH-CH-CH-CH-CHANGES

In the decades ahead, the infrastructure supporting our communities will look somewhat different from and perform quite differently than what's in place today. While the future may not look quite like the Jetsons, it will not look like Mad Max either. A whole range of technological, social, economic and market changes will drive infrastructure toward greater efficiency and reduced environmental impact.

But don't put your SUV up on blocks quite yet. Although we know the future will look quite different, it is not at all clear how we get from here to there. We urgently need investments in infrastructure in the state right now, and investments we make today have a lifespan measured in decades. What we build today will still be in use in that brave new future. In building facilities today we cannot ignore all the possible changes to the way we use water, energy and transportation infrastructure in the state, yet we cannot wait around to figure out which of those possible changes will, indeed, be viable.

Infrastructure investments made today must pass two critical tests. They must:

Respond to today's needs and realities. Washington's infrastructure needs, both at the statewide level and the local level, are well known and well documented. Equally well known is the fact that we cannot afford to pay for all those needs. This means that every infrastructure dollar must go towards identified needs, rather than toward speculative investments in experimental technologies. The individuals and businesses that

use infrastructure change their patterns slowly, so we should not make investments predicated on sudden shifts in uses.

Adapt easily to new uses and technologies. We should not build infrastructure that may become obsolete before its time. Infrastructure should be planned and designed to adapt to new and yet unknown technologies and patterns of use.

The trick, then, is to neither try to predict the future nor to ignore the fact that it will be different from the present.

Drivers of change in infrastructure

Beyond population growth, three forces will compel public and private infrastructure investors to consider changing the way they plan and design facilities. These forces will all show up below in our overview of current issues involving transportation, energy and water.

Technology. A new computer may become obsolete in a year or two, while a road . . . well, Italians still use roads built during the Roman Empire. Although we do not tend to associate technological change with infrastructure, technologies will alter infrastructure investments. In the transportation arena, electronic transponders create new opportunities for highway tolling as both a demand management and funding tool. Wind farms, although still a small part of the energy base, are sprouting across the state. The disappointments of past solar energy technologies may be remedied, and tides and waves remain an untapped source of energy. Water desalination, commonly used on board ships and in desert countries, might even turn out to be more cost effective than mitigating the use of natural sources.

Some of these technologies will pan out and some will not: just because something is possible does not mean anyone wants to rely on it or pay for it. Adopting new technologies is always risky, but sticking to old ones can be equally risky. One-hundred-fifty years ago, huge investments in canals were wiped out by the advent of railroads, and today's favored infrastructure may get eclipsed by some yet unknown technologies.

Environmental ethics. Polls consistently show that the majority of the public has concerns about the environment. It appears that global warming may be nearing a public opinion tipping point, after which energy and transportation infrastructure investments will be held to a new and higher standard of environmental performance, and water conservation will become a larger imperative.

An environmental ethic does not, however, translate easily into meaningful decision-making criteria. Important investments must be based on sound science, technology and management, not on conventional wisdom. For example, fuel prices and worry about global warming may send commuters scrambling to the bus. But using park-and-ride lots and a diesel bus system can have worse energy and environmental impacts than simply driving to work in a fuel-efficient car.

Lifestyles. The Growth Management Act encourages a shift toward dense urban housing with the expressed purpose of lowering the burden on infrastructure. Compact development is designed to promote walking and transit use over driving, and fewer back yards means less summer water use. In many areas of the state this shift is happening, with a booming condominium market in Seattle, Bellevue and Tacoma, and hot selling townhouse and small lot developments everywhere. It is far too early, however,

to judge the impact of these trends on infrastructure. The buyer of a condominium in Downtown Seattle may work down the street, but could just as easily work 20 miles away at Microsoft in Redmond.

Constraints on change

The rate of change in infrastructure development remains highly unpredictable and subject to some key factors:

The pace of social change. If social engineers had their way, we would all walk or ride bicycles between high rises, contemplate drought-resistant plants in rock gardens and keep our thermostats at a cozy 62 degrees in winter. Americans tend to resist being told how to live, however, and resent the imposition of social agendas. The use of infrastructure reflects societal values, and those values change slowly.

One value that will never change is the insistence on choice. Americans want abundant choice in everything, and expect infrastructure to support the pursuit of those choices. This is where the ideal of the self-contained, walkable community runs into trouble. A person certainly *can* live, work and shop all within a few blocks, but that severely limits their choice of everything from jobs, schools and churches all the way to latte stands. Infrastructure investments cannot ignore this dynamic.

Cost and risk of failure. Getting out in front of change in the planning and management of infrastructure can be expensive and risky. The electric power debacle of 2000 proved enormously disruptive and costly. The Seattle Monorail blew millions of dollars. The Washington Public Power Supply System left ratepayers in the state with billions of dollars in bonds, one operating nuclear plant, and a pair of cooling towers to look at on the drive to the ocean.

So who pays and assumes the risk of failure? In earlier eras, the federal government put up a large part of the cost of new infrastructure, financing dams, highways, rail transit and sewage treatment. Today, however, the federal government assumes little cost burden or risk in infrastructure, leaving state and local tax and ratepayers holding the bag.

Reliability. Since the 2000 disaster, electric power utilities have backed off the idea of a freewheeling power market and are returning to proprietary generating sources and long-term supply contracts. While the innovations of the market may have promoted efficiencies through competition, they struck at the heart of a key requirement of infrastructure: reliability.

Innovation always carries some risk of unreliability, and many industries and public services consider such risk an accepted price of progress. Basic power, water and transportation infrastructure, however, has a very low tolerance for unreliability: the health and safety of the population is too important.

Existing investments. Public infrastructure is never an end in itself: a road has little value without vehicles. Infrastructure strategies must take into account the private investment – by both businesses and individuals – that is predicated on current technologies and management practices.

Setting priorities for infrastructure investment

Because money is always limited and inadequate, elected officials and agencies engage in a continual tug-of-war over priorities among three basic types of investment.

Retrofit or replace aging systems. Much of the state's infrastructure is reaching the end of its useful life. Roads and bridges need to be resurfaced, or in some cases, completely rebuilt. Water systems need new pipes and pumps. Energy systems, from generating stations to neighborhood pipelines and poles, require replacement. Although much of this work is done on a pay-as-you-go basis, the larger investments inevitably end up on project lists for bond issues, levies or other taxing mechanisms.

Upgrade systems to new standards. Some facilities must be upgraded to new engineering standards long before their useful life is up in order to meet new regulations or public expectations. These necessary upgrades may not extend the lifespan of the facility or expand its capacity. In other words, some big infrastructure investments do not yield any direct benefits to users. Two new imperatives have been added to ongoing safety and environmental upgrades: earthquakes and security from terrorist attack.

Add capacity for growth. Washington is expected to add another million residents and 400,000 new housing units in the next ten years. Although a few brave souls will live "off the grid," just about every one of these new homes will need a connection to a street and to sewer, water and power lines. While new developments cover the cost of infrastructure within their immediate area, strains will appear in the larger systems – freeways, arterials, water sources, power grids – resulting in building moratoria.

As these three broad categories of investment compete for funds, priority often goes to the first two, with growth capacity coming in third place. For system administrators and elected officials this makes sense: it is appropriate and popular to ensure the longevity and integrity of existing systems. The problem is, though, that growth continues unabated. And while lifestyles have begun to change, we have not seen major reductions in demand for basic infrastructure. Those million people on the way will mostly own cars and all will need to flush.

As elected officials and agencies set priorities for infrastructure investment in the coming decade, they can try to anticipate new technologies and social changes that result in new usage patterns. But it would be irresponsible to plan infrastructure as though technology and use are about to change radically. As we rush to rebuild and upgrade our infrastructure systems we cannot ignore the coming million people or pretend they will act significantly different than the people already here.

A LITTLE LESS CONVERSATION, A LITTLE MORE ACTION

Looking forward, we can hope to see the payoff of years of policy debates and legislative action, as agencies and utilities move from planning to implementation.

Transportation: bigger projects, bigger money

With the adoption of the "Nickel" revenue package in 2003 and the "Transportation Partnership" package in 2005, the Washington State Department of Transportation (WSDOT) will have an additional \$550 million to spend for highway projects in the 2005-2007 biennium. This new revenue stream, heavily leveraged with bonding and combined with pre-existing fuel tax and license revenue, will result in capital expenditures of \$2.6 billion during the 2005-2007 biennium. Table 1 shows that without the two new programs, capital expenditures would be just over \$1 billion for the biennium.

The evidence is everywhere: orange barrels, clouds of dust, scary temporary lanes. And in its “Gray Notebook,” WSDOT claims that 95 percent of Nickel projects in the past three years have been completed on-time, and 90 percent of them on-budget (Washington State Department of Transportation, 2006). In total, the Nickel program will complete about \$3.5 billion in projects over the next eight years, and the Transportation Partnership Account will fund \$7.3 billion in projects over 16 years.

Table 1: WSDOT Projects 2005-2007 biennium

	Projects	Spending (\$000s)
Pre-2003 Funds	923	\$1,061,010
Nickel Program	145	\$1,192,198
Transportation Partnership	178	\$409,727
Total	1246	\$2,662,935

Source: WSDOT Gray Notebook

These programs turn out to be the easy part. The 2002 Legislature created the Regional Transportation Improvement District (RTID) to raise additional funds for the Central Puget Sound region. Voter-approved

RTID revenues would be matched by revenues from the new Transportation Partnership Account to fund giant projects like the replacement of the Alaskan Way Viaduct, the SR-520 floating bridge and the widening of I-405.

After four years, however, the RTID has yet to place a proposal on the ballot. In early 2006 the RTID began working with Sound Transit on a joint ballot proposal for highway and transit improvements to be put before the voters in 2007 (Regional Transportation Improvement District, 2006). This work continues. Both agencies rely on some combination of sales tax and motor vehicle excise tax, and they need to come up with a tax package that will raise enough money for their ambitious project lists while not causing voters to faint.

Not to be outdone by the state, RTID and Sound Transit, the Mayor of Seattle and the King County Executive have both proposed major programs for roads and bus service, respectively. The proposed 20-year City of Seattle program (“Bridging the Gap”) would raise \$65 million in its first year, from a combination of a property tax levy lid lift, a new commercial parking tax and a new employer head tax. County Executive Sims’ “Transit Now” proposal would increase the King County Metro transit budget by \$50 million per year from a 0.1 cent per dollar sales tax increase.

Table 2: Transportation issues faced by Seattle voters

	Average per-household impact
Sound Transit	Minimum \$100
RTID	\$120
City of Seattle: Bridging the Gap	\$195
King County: Transit Now	\$25
Total	Minimum \$440 per year

Source: WSDOT Gray Notebook

The political problem raised by having three different local transportation funding proposals is the potential for voter overload in Seattle. In typical elections for tax increases, large numbers of Seattle votes are needed to offset suburban voter resistance. But although Seattle voters do tend to favor spending measures, they will hit the wall eventually. The same voters who have raised their taxes in recent years for libraries, parks and housing will face a significant hit on transportation, as shown in Table 2.

Further complicating the fate of the RTID for the Central Puget Sound region is the ongoing debate over the configurations of replacements for the Alaskan Way Viaduct and the SR-520 bridge. Citizens who favored a

losing option on either of these projects may vent their displeasure by voting against the RTID funding proposal.

A larger concern hangs over all these road and highway programs: they do not add much new capacity to accommodate growth. Two of the largest projects, the Alaskan Way Viaduct and SR-520 replacements, may not add any new general purpose lane capacity at all. The other huge project, expansion of I-405, will add capacity in some areas, but that will mostly have the effect of relieving existing congestion, and will not leave much slack in the system for future growth. The current RTID proposal appears to contain only one truly new corridor, the Cross-base Highway in Pierce County.

Within the priority system outlined above, the lion's share of revenues continue to be dedicated to preservation, rebuilding and upgrades. Some of the capacity expansions under the Nickel, Transportation Partners and RTID programs will support new growth, but much of the new capacity will be soaked up with relief of existing congestion.

Energy: back to basics

A decade ago energy, especially electric power, was the new frontier of innovation in infrastructure. Electric utilities would become vertically disintegrated, concentrating on retail customers and leaving generation and transmission to large national vendors who would compete with one another for sales. All this restructuring would result in lower costs.

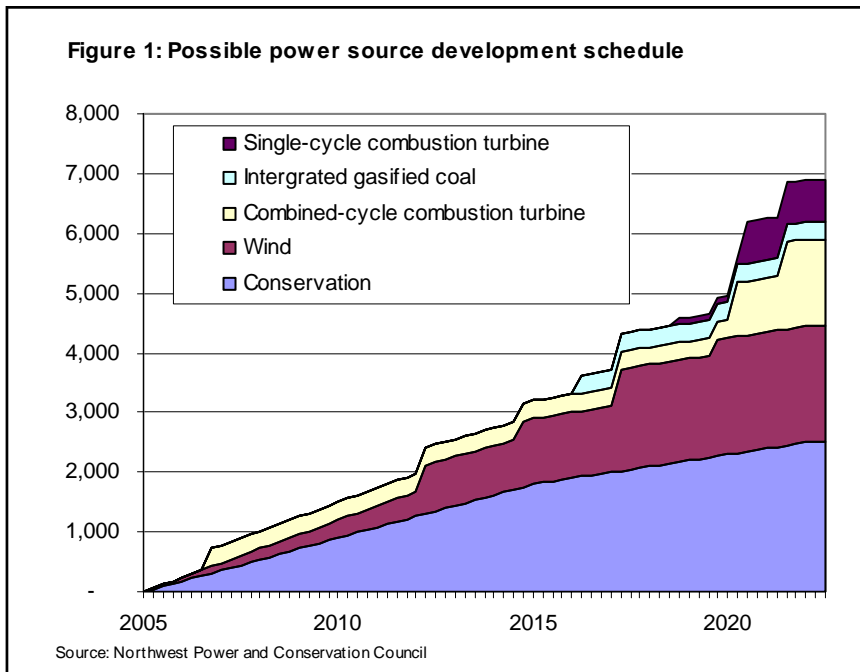
Then it did not work. The disastrous summer of 2000 taught everyone a lesson. The trade-off of control and predictability for lower costs turned out to be far more difficult to pull off than anyone had imagined, and utilities began to revert to their former

vertically integrated selves. Rather than looking for the invisible hand of a deregulated market to ensure abundant, inexpensive energy, utilities in the Northwest are heading back to the basics, but with a few new twists. Plans from the Northwest Power and Conservation Council (NPCC), as well as from the large integrated utilities will emphasize:

Conservation. Freeing up power through conservation can still be the most cost-effective way to get power to new customers. The NPCC has set a target of 700 average megawatts (aMW) in power savings between now and 2009, and 2,500 aMW over the next 20 years (Northwest Power and Conservation Council, 2005).

This makes conservation responsible for about half of all new power in the Northwest in the next five years, and about one third of new power over the next 20 years. (See Figure 1)

Business, it appears, will do most of the conserving. The NPCC expects business to contribute about two thirds of the savings. Seattle City Light expects its commercial and industrial customers to contribute over 80 per-

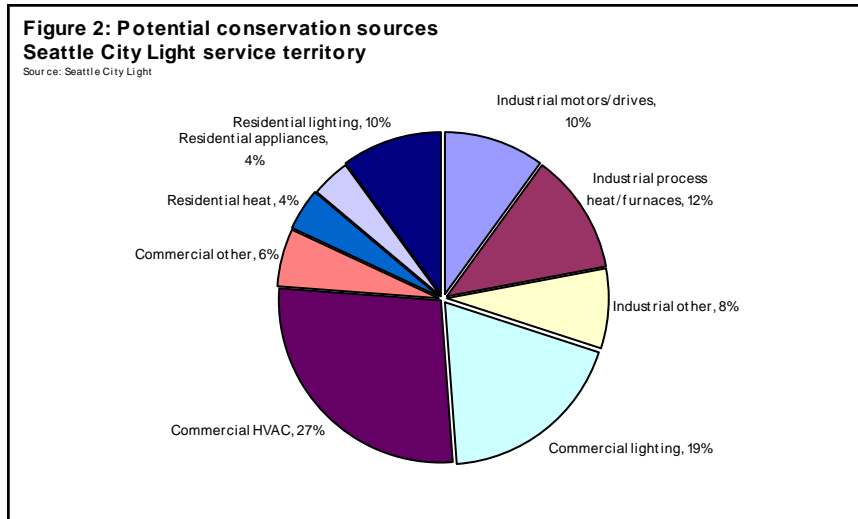


cent of savings (Seattle City Light, 2006). Figure 2 shows the conservation potential identified by Seattle City Light for its service territory.

Planning for conservation is a challenge because it is triggered by several unpredictable factors. “Lost opportunity” conservation comes from purchase of energy-efficient equipment, either newly installed or replaced.

“Discretionary” conservation comes from changes in behaviors or operations. Both of these are motivated by economic perceptions and realities, which are not easily anticipated.

Demand response. In a demand response program, utilities undertake agreements with large commercial or industrial power users to suspend their operations during times of peak demand or when supplies become especially strained. Unlike conservation, this is not a permanent source of power that can be redistributed, but it



does provide a relief valve to improve system reliability and avoid expensive purchases on the spot market. The NPCC anticipates having 500 aMWs of power available from demand response programs in the next five years (Northwest Power and Conservation Council, 2005).

Demand response approaches have not, however, been around long enough to have established regulatory and market frameworks. It is not yet entirely clear how pricing would work and how investor-owned utilities would fit demand response into their regulated business model (Puget Sound Energy, 2006).

Wind. Wind energy has long been seen as a promising source of power, and technology has finally caught up to that promise. New wind generating facilities are being built around the state and are showing up as more than a blip on the power meter. NPCC expects the Northwest to add 1,100 aMW of wind power over the next ten years, and up to 2,000 aMW over 20 years (Northwest Power and Conservation Council, 2005).

Wind power does have one big liability: the wind does not always blow. Puget Sound Energy’s new Hopkins Ridge generating station recorded one 24-hour period in which it generated an average of 110 MW, followed by another 24-hour period in which it generated just 10 MW. Wind clearly needs to be part of a larger and more diverse portfolio of energy sources. Another uncertainty of wind power comes from the federal government: current wind generating projects have benefited from a federal tax credit that may not always be in place.

Thermal. With its abundant hydroelectric power resources, the Northwest has relied less on thermal power – coal, petroleum, natural gas, biomass – than other areas of the country. But it now looks like thermal power will be increasingly in our future. NPCC expects some new natural gas fired capacity in the near term, but anticipates other thermal capacity much later in its current plan. By the end of the planning period in 2025, NPCC expects to have about 2,600 aMW of power from various thermal plants in the Northwest (Northwest Power and Conservation Council, 2005).

Energy from combustion of hydrocarbons, while the most cost effective form of new generation, runs smack into concerns about air quality and greenhouse gasses. The newer “integrated gasification combined cycle” coal plants are far cleaner and produce far fewer greenhouse gases, but their higher up-front cost has made them less popular with utilities. And if, as noted above, public opinion shifts significantly in the direction of greater environmental sensitivity, even the cleanest combustion plants may run into serious political roadblocks.

The schedule of phasing in these sources of power is highly uncertain. Conservation, gas turbines and wind will come on-line first, with innovative combustion sources coming on-line in later years. Figure 2 shows a possible schedule for development of new sources across the Northwest.

For anyone skeptical of human behavior, Figure 1 can raise some alarms. With the exception of 300 aMW of gas turbine capacity, the NPCC has placed near total reliance on conservation and wind power to meet electric power needs for the next 10 years. And if Seattle City Light’s assumptions in Figure 2 are accurate, a huge amount of that conservation burden will fall on business and industry. Public resistance to new wind facilities can be expected to grow, and businesses may or may not be willing to retool their capital stock and operations to that scale. Gasified coal technology may still raise some questions, but we will likely need to move that direction sooner rather than later.

Water: holding on to gains

For the time being, water supplies in the urbanized areas of the state appear to be adequate. The good news is that the Department of Ecology has been working down its huge backlog of water rights requests, and the bad news is that most requests for new rights are being denied. Most water sources in the state are fully allocated, making efficient use an imperative. Municipal water systems that serve residences and businesses have made some important gains in the past few years, but those gains are threatened by legal and political maneuvering.

Water rights and House Bill 1338. In 2003, the Legislature finally addressed some of the peculiarities of Washington water law: a legal system designed for farmers and miners was not working well for industries and subdivisions. House Bill 1338 addressed many of the headaches faced by municipal water systems (Washington State House of Representatives, Committee on Agriculture and Natural Resources, 2003).

One of the most important issues addressed in HB 1338 was the problem of “place of use” in municipal water supply. Prior to this change, when a municipal system acquired a water right, it could only use that water in the physical place where it had been historically used unless the utility went through a cumbersome process with the Department of Ecology (DOE). HB 1338 allows a municipal system to use water anywhere in its service territory without going through DOE. This makes it practical for municipal systems to acquire water rights previously used in industrial, commercial or agricultural operations.

This new flexibility in place-of-use, combined with the existing municipal exemption from the “use it or lose it” doctrine, gives municipal water systems the ability to plan ahead for growth. The GMA pushes growth into urban areas with existing water systems, but those systems

do not always have the capacity to serve new hook-ups, resulting in building moratoria. Municipal systems can now aggressively pursue transfers of existing water rights for use throughout their systems, giving them the ability to find water at one end of their service territory for use at the other end.

This and other provisions of HB 1338 have come under attack by Indian Tribes and environmental groups who want to see more water left in streams (Arum, et al, 2006). Opponents want to force municipalities back to DOE every time they acquire a water right and they want to restrict the ability of small private systems to reserve water capacity. Although these efforts have been unsuccessful in the past two sessions, the issue remains on the tribal and environmental agenda.

Columbia River water management and HB 2860. In the 2006 session, the legislature made important strides in improving management of water from the Columbia and Snake Rivers. HB 2860 sets up a Columbia River water management program and provides up to \$200 million for development of new conservation or storage programs.

A key purpose of the legislation is to find ways to work down the huge backlog of applications for new water rights in the Columbia-Snake basin. One new mechanism is a system of voluntary agreements under which an applicant for a new water right can help identify conservation measures that would free up the water they seek.

Although water legislation is often quite contentious, final passage of the bill was unanimous in the Senate, and had just four dissenters in the House. One reason for the lack of opposition is the bill's careful balancing of priorities. Two-thirds of new water stored or conserved must be allocated to "out-of-stream" uses, such as agriculture, municipal or industry needs, and one-third of new water must be used to enhance stream flows for fish.

Global warming as catch-all. Because water supply in the state is heavily dependent on snow pack in the mountains, fears of climate change are playing an increasing role in water supply issues. But the evidence at the global, as well as the local level, does not provide an accurate picture of potential changes. We are a long way from having models that are sophisticated enough to predict the impact of climate change on water supply, and yet the fear of disappearing snow packs is being used to drive public policy.

Pssst. . . want some used water? For years, sewer utilities have been touting the benefits of water re-use. They certainly have a good supply of the stuff to sell. With secondary treatment in most of the state, effluent can be treated for non-potable re-use at a modest cost. And it makes a lot more sense to sell that effluent than to dump it into Puget Sound.

The problem is, economics keep getting in the way. The treated effluent may be inexpensive to produce, but the infrastructure to convey it to appropriate uses remains prohibitively expensive. No one wants to risk mixing used water with fresh water, so a re-use strategy requires an entirely new system of pipes and pumps, at great cost. Sewer utilities will come under pressure to market used water to help offset capital and operating costs of treatment facilities, but no one knows how to pay for the rest of the infrastructure.

Emergency planning. Hurricane Katrina once again showed the catastrophic impact of the loss of safe water supplies. The fear in Washington is earthquakes which could knock out water delivery systems, leaving large populations without safe water for a very long time. One solution for vulnerable areas is to drill and maintain wells for emergency use only. One municipality, Mercer Island, has attempted to undertake this strategy, only to be told by DOE that they need a water right (which, of course, they will never get). Cities and water districts that get their water from purveyors, such as the Seattle or Tacoma systems, should be able to drill emergency wells to ensure health and safety in the face of an emergency.

Looking ahead: time to build

The three areas of infrastructure discussed in this paper have all seen significant progress on the policy front in the past several years. The state highway system got a massive influx of money, the energy industry is on a stable path after the disaster of 2000, and water systems have the tools to expand. Although local road systems are still hurting for funding, most infrastructure agencies and utilities in the state can now concentrate on the business of building highways, power generation and transmission facilities, and pipes and pumps.

It has taken years of effort to get to this point of relative policy stability in which infrastructure providers can concentrate on building. What we do not need right now is any radical new policy directions to halt the progress won so far. Infrastructure proponents need to anticipate efforts to roll back transportation funding, to roll back water system flexibility, and to halt development of new energy facilities. The dreamers will continue to come up with radical new technologies guaranteed to solve all of our problems, and we can expect global warming to pop up at every turn.

Infrastructure proponents cannot expect to tame the forces trying to reverse progress or to promote radical new policies. We can, however, diminish their effectiveness by keeping the broader public supportive of new investments. That means delivering projects on-time, on budget and safely within environmental constraints. Given the long list of failed infrastructure projects in the state, the public has reason to be skeptical. Infrastructure agencies now have the job of putting that skepticism to rest.

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