Technology to help cities manage booming USA

By Haya El Nasser, USA TODAY
April 24, 2007
Commuters stuck in creeping traffic are bound to wonder: If streets and highways are this clogged when the nation has 300 million people, how will 400 million ever get around?

Blackouts in cities such as New York, Cleveland and Detroit in recent years raise questions about what will happen when aging electrical grids can't send enough power to heat and cool more people.

Planners looking at the boomtowns spreading across the Southwestern desert are asking: Where's the water going to come from?

The USA is growing more rapidly than any other developed nation and is projected to gain another 100 million people by 2040. That will put new pressure on a public infrastructure that's already stretched thin.

As scientists, engineers, builders and public officials grapple with how to accommodate the nation's unprecedented growth, small steps being taken today could chip away at the challenge. The focus: technology that could revolutionize how traffic moves, power is generated and transmitted and water is recycled, as well as where homes are built.

The challenge is daunting: At today's consumption rates, the nation will need another 280,000 miles of highway, and 78 million more cars and trucks will jam roads by 2040, according to the Federal Highway Administration and the Center for Environment and Population, a non-profit research and policy group in New Canaan, Conn.

Based on current energy use, the country will need to build more than 500 medium-sized power plants to generate the extra electricity the USA will use by 2030, according to the Energy Information Administration, the statistical arm of the Department of Energy.

If the USA's per-capita water use for home, industry and agriculture remains 1,500 gallons a day, it will need another 150 billion gallons each day — about three times what California now consumes.

Signs of technology being harnessed to address such issues are emerging across the nation. Along some highways, electronic transponders and overhead sensors that instantly deduct money from motorists' accounts have begun easing gridlock by dramatically reducing chokepoints at toll plazas.

Other, less visible innovations also are underway:

•Power substations needed to sate the nation's hunger for electricity are being placed underwater and underground. Parks are being built above them to maximize green space.

•Water purification projects are turning sewage into water that's almost fit for drinking. The recycled water can be used by industries, and to water parks and golf courses without depleting rivers and lakes.

•To try to lure people out of their cars and onto buses, transportation agencies are using wireless technology so riders can stay linked to the Internet during their commutes.

"Technology is going to be absolutely essential" for the nation to absorb growth, says Tom Daniels, professor at the University of Pennsylvania's department of city and regional planning. "There are three main challenges: One is energy, second is transportation and the third is going to be water."

No doubt, says Victoria Markham, director of the Center for Environment and Population. She notes, however, that technology also can encourage more energy and water use as people buy more cars, washing machines and electronic equipment. She says per-capita energy use has increased during the past decade.

Even so, she says, a public that is increasingly focused on the environment is pressuring industry and government to produce goods in a more energy-efficient way.

"There is more of a groundswell of interest on the part of the average person in caring how much energy and water they're using," Markham says. "For the first time, they're starting to see the average American's impact on climate and the environment."

Streamlining road travel

Moving ever increasing numbers of people without paralyzing gridlock is a stiff challenge for big cities around the world. This year, German engineering and electronics giant Siemens AG released a report on the strains that growing populations put on major cities.

"With all the other issues in health care, education and crime, one of the biggest on their plates is transportation and congestion in their cities," says Ken Cornelius, chief executive of Siemens One, a U.S. subsidiary that works with airports, cities and hospitals. "It's becoming more and more of a problem and it's an expensive problem to fix."

Technology already has created commuting flexibility by allowing people who have computers to work from anywhere, easing rush-hour congestion a little. Making more profound changes are toll roads and express lanes that charge solo drivers steeper rates at peak hours, measures designed to keep traffic moving and encourage carpooling and using public transit.

As pay-to-drive becomes the norm in more metropolitan areas, road agencies are learning how to collect money without slowing traffic. Transponders in car windshields transmit signals as they go through toll plazas or, better yet, whiz past overhead scanners in Chicago, on the New Jersey Turnpike and in the Austin area.

"Toll plazas used to be bottlenecks," says Jack Finn, senior vice president of HNTB, a national engineering firm based in Kansas City, Mo. "We're converting old toll plazas, ripping out some of the booths. … It's taken a long time to catch on but it's a much more efficient way to move people."

Other innovations:

•On a new elevated, three-lane toll road where lanes reverse direction during rush hours in and out of downtown Tampa, every car must have a toll tag. Drivers who don't have tags get 24 hours to pay online. If they don't, they'll receive a violation notice by mail based on photos taken by highway cameras. Traffic keeps moving because no car has to stop to pay.

•Transportation agencies are using websites to post live camera feeds of traffic. Traffic alerts sent by e-mail can be picked up on cellphones and BlackBerrys in about a dozen cities, including Arlington, Va.; Jersey City; Toledo, Ohio; Tulsa; and St. Louis.

•Public agencies, including those that run new light-rail lines in cities such as Phoenix and Charlotte, are using technology to make buses, trains and subways more attractive. It's a significant challenge for transportation planners who for decades have concentrated on the automobile.

The Utah Transit Authority, which manages public transportation in the Salt Lake City area, is testing electronic wireless credit and debit cards on 44 buses. Credit cards can be waved in front of a machine to pay fares. There's no fishing in your pocket for change, no need to swipe a card and wait for approval. Using the "contactless" cards can save up to one minute per passenger who would normally pay cash.

About 135,000 residents in the six counties the Utah authority serves — or about 3% of the area's population — use public transit each day. The agency hopes to boost ridership 7% a year.

The American Public Transportation Association says a key to getting more people out of their cars and onto buses and trains is to expand bus and rail systems and make them quick and convenient to use. Buses and trains increasingly are being equipped with global positioning system devices. They help pinpoint underused and congested routes and enable agencies to map routes and draft more precise timetables for riders.

Meanwhile, more than a dozen transit systems from Pompano Beach, Fla., to Reno are offering Wi-Fi access on buses and trains to attract commuters who want to surf the Internet on their way to work.

Houston TranStar, a group of transportation agencies in the Houston area, this summer will try to speed up bus and rail fare payments by replacing more than 60 current ways to pay fares (monthly passes, visitor passes, student passes, senior passes, etc.) with three: cash, the smart "Q Card" and "Metro Money," a temporary smart card that can be purchased in stores. Smart cards are swiped at stations or on buses and the fare is automatically deducted from a rider's prepaid account.

Whether such innovations will get more people to ride trains and buses is unclear. "You're going to have to see gasoline go over $10 a gallon," Daniels says.

Bulking up the power grid

Two-acre Roosevelt Park in Anaheim looks like any other Southern California neighborhood playground: plentiful trees and lush lawns, barbecue stations and winding walkways.

Under the feet of frolicking children, however, hums a high-voltage power substation encased in concrete and filled with fans and electrical converters. Ten cables stretch 23 miles underground from the invisible facility — the first of its kind in the USA — distributing enough electricity to serve more than 25,000 homes.

Using older technology, Anaheim Public Utilities would have had to build a substation 5 miles away, consume 70% more space and extend cables to neighborhoods where residents need electricity but vehemently object to power lines above their heads. The $20 million underground facility distributes electricity without eating up valuable real estate.

The 2003 blackout in parts of the Northeast and Midwest — the worst in U.S. history — affected about 40 million people in eight states and intensified concerns about the nation's aging electrical grids, particularly in densely populated areas.

"High urban density makes it very difficult to build a transmission line and bring power in," says David Pacyna, president and chief executive of Siemens Power Transmission & Distribution.

That's where the technology that created the Anaheim substation comes in. Networks that conduct the electricity are insulated with inert gas rather than air, a process that takes up less space. This compact new breed of substation can be enclosed underground rather than take up several acres of land.

Private companies, including Siemens, are working with the Long Island Lighting Authority to build a 65-mile underground cable, part of which would run underwater in New York Harbor. That will enable Long Island to tap in to electricity generated in Pennsylvania, New Jersey and Maryland.

Stretching water supplies

The West Basin Municipal Water District in Carson, Calif., south of Los Angeles, did not recycle water in 1995. Today, it recycles 35 million gallons a day — enough water for 78,000 households — and the amount is projected to double by 2020. That would cut in half the amount of water the agency imports from northern California and the Colorado River.

"It's the new technology … that really allows higher levels of water to be produced and used," says Paul Shoenberger, the district's assistant general manager. "We're reducing the amount of energy needed to produce water, we're recycling sewage effluent, we're treating it, and we resell it to industries. … It just makes sense to use water more than once."

Half the water the district supplies to the city of El Segundo's school yards, ball parks, golf courses, refineries and other industries is recycled.

Another key water issue: desalination. That's because about 97% of the Earth's water is in oceans. The method is used widely in the Middle East even though it costs up to four times as much as other water recycling methods. U.S. coastal communities are increasing their investments in desalination plants, and costs are coming down.

For water, says Daniels of the University of Pennsylvania, "the mantra is reduce, reuse and recycle. When you see new houses built, you're going to see two sets of pipes: one for gray (recycled) water to water your lawn and wash your car and one for drinking water."