

Personal Rapid Transit Informational Forum

Rochester, Minnesota
November 17, 2009

A Summary Report



Sponsored by:
Minnesota Department
of Transportation



Hosted by:
Center for Transportation Studies,
University of Minnesota

Contents

Introduction and Welcoming Remarks	1
Presentation: Context for PRT and Potential Applications.....	2
Presentation: PRT Niches.....	4
Panel: Public and Private Perspectives.....	6
Panel: Legislative Discussion.....	8

Introduction and Welcoming Remarks



Tom Sorel



Laurie McGinnis

Personal rapid transit (PRT), or the use of small, on-demand podcars to serve public transportation needs, has been under discussion since the 1960s. So far, only one PRT system has been built, a college circulator in Morgantown, W.Va. But with two new PRT systems about to come online—one at London’s Heathrow airport, and the other in Abu Dhabi’s planned Masdar City development—cities are taking a new look at the technology, and a growing number of PRT engineering firms are looking for clients.

With that backdrop, the Minnesota Department of Transportation (Mn/DOT) brought together PRT companies and policymakers at a November 2009 forum to discuss the potential of PRT in Minnesota and beyond. The Center for Transportation Studies (CTS) at the University of Minnesota hosted the event for Mn/DOT.

Mn/DOT commissioner Tom Sorel and Rochester mayor Ardell Brede gave the forum’s opening remarks. Laurie McGinnis, acting director of CTS, served as moderator.

Sorel said he is seeing a “paradigm shift” in mobility needs and how transportation agencies meet those needs. Because of the groundbreaking work of longtime University of Minnesota professor Ed Anderson, a PRT proponent since the 1960s, Minnesota is an ideal place to talk about PRT, Sorel said.

“I get the question all the time, why PRT, why PRT in Minnesota,” he said. His response: the state’s vision is to be a global leader in trying new transportation technologies. “We want to give people options, to be a multimodal agency,” he said. “We owe it to our citizens to explore these kinds of things.”

[Presentation]

Context for PRT and Potential Applications

Introduction: *Laurie McGinnis*, Acting Director, Center for Transportation Studies, University of Minnesota

Speaker: *Ferrol Robinson*, Research Fellow, Hubert H. Humphrey Institute of Public Affairs, University of Minnesota



Ferrol Robinson

In this keynote presentation, Ferrol Robinson, a research fellow on transportation issues at the University of Minnesota's Humphrey Institute, discussed the promise of personal rapid transit and potential applications in Minnesota. Robinson worked on the proposed People Mover project for downtown St. Paul in the late 1970s and on a similar project for downtown Indianapolis in the 1980s. Recently he has helped develop PRT concepts for four Minnesota cities.

He began by making a distinction between the uses of personal rapid transit and other modes of transportation. PRT is only an alternative to buses and light-rail transit (LRT) when those modes don't have a good way to provide a service. For example, light rail might not be the best option for a downtown circulator. The two serve different uses and different markets, he said.

Robinson cautioned that PRT is not a magic bullet that will solve transportation problems. "It's going to take all the systems, all the technologies to solve transportation problems." PRT is highly competitive with the automobile, however, and it can be complementary with public transit and extend the range of walking and bicycling, he said.

The technology has now reached a point where some former skeptics, like smart growth expert Peter Calthorpe, see it as a feasible tool, Robinson said. "If you think of what you would want from an ideal transit technology, it's PRT," Calthorpe said at the 2005 Congress for New Urbanism. "Stations right where you are, within walking distance, no waiting."

Some qualities that distinguish PRT from other modes of transportation include its on-demand service, short headways, and constant availability. "Because it doesn't mix with other vehicles, it's fast, reliable, the travel time is predictable, and you have short

wait times," Robinson said. "The vehicle waits for you at the stations. It's 24/7. From a service level it's pretty high."

The systems have segregated tracks, part of the reason for the fast, nonstop service. Most cars hold three to five passengers. The stations can be elevated or underground, and are closely spaced to increase accessibility. Because the PRT cars don't mix with other traffic, speeds can reach 25 to 30 mph, and the travel time is more predictable, he said. Current systems have an energy consumption of 200 to 300 miles per gallon and produce no local emissions. PRT systems have a people-moving capacity of 3,000 to 4,800 passengers per hour, depending on how many people share the ride, Robinson said.

Key uses for PRT include solving the "last-mile" gap that deters some users from using public transit. PRT could also be used as a circulator or shuttle between transit and other medical, shopping, or education hubs, or to connect heavy trip generators close to each other. "You could envision perhaps, the University of Minnesota West Bank, East Bank, Fairview Medical Center, operate a shuttle system that's PRT based," Robinson said. "You have a lot of trips generated at either end."

It would also be ideal for serving people on midday trips to downtowns and other areas, when buses run less frequently than rush hour. "A lot of trips in these areas, downtowns, are not well-served, there's really no transit service," he said. "Skyways are a good way but have a limited range. If you serve the last mile, people will be a lot more resourceful about solving the first mile for themselves," he said.

Robinson said downtown Minneapolis generates more than 500,000 trips a day in and out of the core area, and St. Paul has about two-thirds that number. "That's a

huge, huge market. If you could capture even small amounts of that, it would be a great service to the users,” he said.

Other areas that could use a PRT system include the I-494 Bloomington and Edina corridors, where multiple campuses draw workers but aren’t connected. “These are large concentrations of employment, but difficult to serve with transit,” Robinson said.

Robinson said PRT works well with other modes of transportation. It can compete with cars in high-density areas where PRT speeds are higher. It optimizes shared-use parking, freeing up land in high-density areas for better uses. It is also complementary to bus, light rail, and commuter rail, by facilitating transfers between modes.

“It makes transit modes that much more attractive without necessarily competing. Often it’s a transfer issue. If you have a [PRT] circulator, picking people up, helping people transfer, how much better would that be?” he said.

In addition, PRT extends the range of pedestrians and can increase the range for bicyclists by giving them an option through auto-dense areas such as downtown.

Despite the technology’s benefits, concerns remain, Robinson noted. One is that

PRT is an unproven technology. “Most of the technology is off the shelf, and has been around for many years,” he said.

Another concern is the visual impacts of building a dedicated guideway in urban areas. Others have raised concerns about the short time between shuttles arriving, how disabled passengers would use the system, and whether people would want to share rides.

The biggest issue, however, might be funding. While a PRT starter system will soon be up and running at Heathrow, questions about funding—whether public or venture capital money—remain, as do questions about whether the systems can pay for themselves.

“Having a public-private partnership is probably the way that we’re going to see this through,” Robinson said.



The Heathrow Personal Rapid Transit system in London

[Presentation]

PRT Niches: Airports, Suburban Job Centers, Circulators

Introduction: *Laurie McGinnis*, Acting Director, Center for Transportation Studies, University of Minnesota
Speaker: *Steve Raney*, Principal, ATS ULTra, North America



Steve Raney

In the conference's second presentation, Steve Raney, a principal with ATS ULTra, gave an overview of current PRT technology and discussed ULTra's recently completed PRT project for London's Heathrow airport.

Current PRT companies use a wide range of designs and guideway systems, Raney said, from the Masdar system in Abu Dhabi, which is "basically a glorified golf car running on its own road," to the Vectus and Skyweb systems on electrified guideways and a suspended cable car system called Skytrans.

The ULTra model at Heathrow is similar to the Masdar system. It uses electric carts in an open guideway system that can be elevated or at grade. The automated vehicles are recharged at the station, rather than by electricity from the guideway. In addition, the vehicles do a deep recharge overnight, Raney said.

While ULTra's model won the biggest recent PRT contract, Raney said the jury is still out about whether it has the best technology or whether it was in the right place at the right time to get the contract from the UK government. The company was founded at the University of Bristol in 1995 and launched its test track in Cardiff in 2002 with funding from the UK.

"It's going to be interesting to see what will happen in the industry in the next 10 years," Raney said, and which technologies will rise to the top.

Heathrow project

When the British Airport Authority (BAA) decided to build its fifth terminal at Heathrow—a terminal that on its own would be the 10th largest airport in Europe—officials undertook a study of the terminal's transportation needs. Among their requirements: a system with low emissions that was space efficient and had a high level of service and value.

PRT won out over more expensive People Movers and buses, in part because the system had to operate around existing buildings and activities. The ULTra circulator runs on an elevated guideway to connect the new terminal and a remote parking lot. Its on-demand nature was particularly useful for this destination.

"PRT was the only practical solution for [the BAA]," Raney said. "It had a 60 percent travel time savings and 40 percent operating cost savings" over other modes.

ULTra won the contract to build the system in open competition. In the process, BAA took an equity interest in the company. The development was eventually funded by \$15 million in private investment and a projected \$15 million in contract revenues, he said. Construction on the project is currently complete, with revenue service scheduled to begin this spring.

The system has 2.2 miles of guideway and 18 operating vehicles. It has 6-second headways and accommodates 700 vehicles per hour. Each trip, to a remote parking facility, is 3 to 4 minutes, Raney said.

The ULTra vehicles can accommodate three to five passengers and luggage. That allows for some ride sharing, although the cost of the shuttle ticket is included with parking at Heathrow.

Concerns about ride sharing have been raised in the past, in particular regarding the circulator in Morgantown, W.Va. Raney said ULTra was not anticipating problems among the business travelers at Heathrow who will likely use the circulator. "Sometimes when you have a more homogenous community, people express that they're pretty comfortable sharing a ride," he said.

While the ULTra starter system at Heathrow now offers on-demand transportation to a parking lot, future phases of Heathrow call for the system to go under the runway

in a transit tube to connect up with airport hotels, parking, and other services, “to be a full-fledged circulation system for the airport,” Raney said.

Lessons learned

In the process of developing the Heathrow project, ULTra went through five sets of control system hardware ranging from magnets in the ground and ending with Lexus cruise control LIDAR, Raney said.

“We had this bias towards using proven technologies, and I think that turned out well for us to reduce our risk,” he said. However, he added, “It was kind of the school of hard knocks in learning what worked could be really reliable for us.”

In contrast, installation of the system was rapid and low-impact. “You can build a kilometer of guideway in a week, with a four-person crew and a crane because you manufacture the guideway off site and just bring it on site,” Raney said. “And we didn’t have to move any underground utilities.”

Raney said the UK safety certification, which requires a safety team to follow the project for months on the front end, also helped the project. “It’s integrated into the process rather than being the last thing you do before you start revenue service,” he said.

The total cost of the Heathrow system was more than \$15 million per one-way mile of guideway, Raney said, higher than the \$7 to \$15 million average other new systems would cost. But that’s in part because the project included some one-time system development costs that wouldn’t apply to future projects.

Minnesota projects

Looking at future uses for PRT, Raney said the Southdale-Edina region and the proposed New Town–Ford Plant redevelopment in St. Paul are two projects that could be enhanced by PRT.

The Interstate 494 corridor is the “second biggest job center in the greater Minneapolis area. There’s a lot of solo commute going on,” said Raney, who led a PRT study for the City of Edina in 2005. “Arterials in that area really back up, [and it’s] not easy to get through that area by car. It’s not a pedestrian-friendly place,” he said.

A PRT circulator could connect isolated job campuses and apartment towers to transit hubs, he said. It could also be part of an effort to transform Edina into a transit-oriented development with many people living near transit hubs.

“It would make the retail here more competitive,” Raney said. “It could spur economic development and transform this place where everybody’s driving to a potentially huge transit-oriented development interfacing with the bus system.” He estimated the Edina system could cost \$45 to \$90 million, “but that’s very ballpark.”

The New Town–Ford Plant project would be a different model. The proposed housing and retail development could become a transit village that included PRT as part of the redevelopment. The high-quality transit would make the development more appealing and add value to the project, Raney said.

“Part of the idea is to potentially create this very high-quality life with a lower cost of living and less driving,” he said. “You take what used to be a two-car family, make it a one-car family, use PRT for errands and maybe have access to a car-sharing vehicle.”

A New Town PRT system that connected to the Hiawatha light-rail line could cost around \$40 million to build, he said.

Funding, funding, funding

While many cities have looked at PRT as a transit option, none in the United States are moving ahead with the projects at present. Raney said a key to stimulating demand could be to have cities compete against each other for the first PRT system. Funding for future projects could come from a wide range of sources, he said, from real estate developers building new projects, to cities that include it in a transit tax.

“We’ve talked about how PRT would help fare boxes of existing transit, which is a good thing, and you could go after federal money,” he said.

For now, a public-private partnership is the most likely option for the next PRT system, Raney said. The public sector might want to “de-risk” the next systems and avoid funding the capital costs to develop the systems, he said.



Mike Lester

[Panel] Public and Private Perspectives

Introduction: *Laurie McGinnis*, Acting Director, Center for Transportation Studies, University of Minnesota

Speakers:

Mike Lester, Chief Operating Officer, Taxi 2000

Ed Anderson, founder, PRT International

Arlene McCarthy, Director, Transportation Services, Metropolitan Council

Tim Henkel, Division Director, Modal Planning and Program Management, Mn/DOT

Naveen Lamba, Global Industry Lead, IBM



Ed Anderson

In this wide-ranging panel discussion, three private PRT vendors and two public agency officials discussed current projects in the planning stages and the next step for PRT in Minnesota and beyond.

Tim Henkel, who is in charge of multi-modal transportation for MnDOT, began the discussion by talking about his agency's role in managing PRT. The state already has the authority to operate high-speed rail in Minnesota, and PRT is another piece to tie into systems for long-distance travel, he said.

Minnesota will continue to see major demographic shifts in coming years, including bigger concentrations of people in the state's urban centers, an increase in the state's elderly population that could spur a greater demand for transit services, and increasing congestion during peak travel times, he said.

With those shifts in mind, Henkel said, "PRT needs to be added to the toolbox of transportation solutions the state needs. It could be an important solution."

The agency's current plan is to solicit letters of interest from companies and cities interested in building PRT systems in Minnesota, Henkel said. (In December 2009, Mn/DOT launched a PRT initiative to study, research, and explore PRT's potential.)

Accessibility, fares

Arlene McCarthy, director of transportation services at the Metropolitan Council, said accessibility and fare policy are two large unanswered questions about PRT from a public agency perspective.

"If you're talking about PRT being last mile, quarter mile, to me, the passenger would have the expectation that they would

have a free transfer," she said. "They rode light rail, they rode a bus, and now they're going to hop on PRT. So that's just a policy question I think would have to be addressed."

She said she also has some questions about whether PRT would supplement the current transit system or duplicate it, particularly in downtowns, which already have a high level of transit service.

Two areas where PRT could be highly complementary are the I-494 and I-394 corridors, both areas with high employment concentrations in campuses separated by distances too great to connect by walking.

"I think PRT has great advantage in that it can bypass station stops," she said. "That's a really tough nut to crack with bus in the 494 and 394 corridors. There isn't high enough ridership to justify all-day service to all of these individual locations."

Masdar project

Naveen Lamba, IBM global industry lead, described the PRT system currently under construction in Masdar City, Abu Dhabi. The 100,000-person planned community is being built with the goal of having a zero-carbon footprint.

The community's transportation infrastructure is a combination of PRT, light rail, and metro rail transit in an interlocking system to serve travelers. No cars are allowed—instead, 3,000 PRT vehicles will provide all the individual transportation needs of the community, Lamba said.

The Masdar vehicles are regular "rubber-tire vehicles on a standard asphalt surface," Lamba said, with tracks mostly built at



Arlene McCarthy



Tim Henkel



Naveen Lamba

grade. What sets them apart from cars is that they are autonomous—not driven by the passengers—and they have a dedicated roadway to travel, “so you won’t have to worry about them running into each other.”

Passengers arriving in Masdar City can make reservations to get from one location to another and let the system book their tickets on multiple modes of travel. “You can say, ‘I’m at the airport, I need to go to such and such hotel, how would I do it and can you reserve all these different modes of transportation for me?’” Lamba said.

A major challenge for making the Masdar system work was to develop algorithms to efficiently move traffic, especially during peak demand periods. “You can’t have all these 3,000 vehicles start out at six in the morning, at a certain time all the batteries will run out, so where in the system should they be placed, based on demand, based on time of day, where do they get off the system for recharging?” Lamba said. “It was those kinds of things we were helping to think through.”

The solution was to create an operating system that allowed for continuous simulation of the entire system simultaneously, he said. Each time someone requests PRT service, that is added to the grid.

The Masdar PRT was originally scheduled to be in operation by winter 2010, but the recession has slowed down the project, Lamba said. Contractor CH2M Hill recently announced it’s about six months away from operation, audience member Peter Muller, president of PRT Consulting, said.

The next PRT project

PRT has a long history in Minnesota, in part due to the efforts of Ed Anderson, who has advocated for personal rapid transit for more than four decades. Anderson, a longtime University of Minnesota professor, is the founder of PRT International.

Minnesota PRT projects included the St. Paul People Mover discussion in the 1970s and efforts to pass a \$4 million bonding bill in 2004 to build a PRT safety certification and test facility in Duluth. That bill was not signed.

Anderson noted that several cities, such as San Jose and Chicago, have reached the RFP stage of PRT planning. And PRT planning is under way in 57 cities in Sweden, he said. In fall 2009, the Swedish government announced four cities that were moving ahead with projects.

As private PRT vendors wait to see which city will build the next PRT system, many are wondering if cities will adopt an open, vendor-neutral standard or if one technology will dominate.

“A lot of people in the industry are talking about how to have an open standard for PRT,” said Mike Lester, chief operating officer of Fridley-based Taxi 2000. The company has a high-capacity PRT shuttle called Skyweb. Lester said a demonstration facility would help answer many questions about the viability of PRT.

PRT Consulting’s Peter Muller said it’s important to look at PRT not just as another transportation technology, but at what it allows planners to do differently. At Heathrow, officials are looking at putting PRT in the central terminal area and eliminating buses and cars from that area, changing the way the terminal operates. In Morgantown, W.Va., the PRT system allowed two university campuses to function as one, he said.

Could PRT allow two hospitals to operate as one? Allow a city to eliminate or reduce automobile traffic downtown? Or make high-speed rail more efficient by using PRT to eliminate some stations?

“There may be lots of applications,” Muller said.

[Panel] Legislative Discussion

Introduction: *Laurie McGinnis*, Acting Director, Center for Transportation Studies, University of Minnesota

Speakers:

Rep. Tina Liebling, Minnesota House of Representatives

Sen. Gen Olson, Minnesota State Senate

Mayor Jerry Miller, City of Winona



Rep. Tina Liebling



Sen. Gen Olson



Mayor Jerry Miller

In the conference's final panel, state Rep. Tina Liebling and state Sen. Gen Olson discussed the challenges and promise of PRT from a legislative standpoint, and Winona mayor Jerry Miller said his city would like to be home of the state's first PRT facility.

"I've been a fan of PRT for a long time," Olson said. "We need to talk to the stakeholders who are interested and get the ball rolling."

Liebling cautioned that funding was tight for many projects, but said she would back a pilot project in Minnesota. "We've got changing demographics, changing demands on our land, a need for an economic boost," she said.

Miller said Winona has been talking to Taxi 2000 about building a PRT demonstration project. The city of 30,000 has several manufacturing companies that could help produce vehicles and the material for guideways, he said. City officials have also talked to local universities about marketing the project. He said the city's next step would be to make a proposal to the state to build the pilot project.

"It's more than an opportunity to get people from one place to another—it's also an opportunity to give people ... a job," he said.

Mn/DOT commissioner Tom Sorel concluded the forum by reiterating MnDOT's leadership and catalyst role with this new technology.

"The door is open," he said. "Let's walk through it."



CENTER FOR TRANSPORTATION STUDIES

CENTER FOR TRANSPORTATION STUDIES, 200 Transportation and Safety Building
511 Washington Avenue S.E., Minneapolis, MN 55455-0375
Phone: 612-626-1077 E-mail: cts@umn.edu Web: www.cts.umn.edu