City of Madison

DEPARTMENT OF

TRANSPORTATION

Transit X Review

May 31, 2019

1.0 Background

Transit X is a company from the Boston area which seeks to manufacture and implement a form of personal rapid transit (PRT) which it calls “flying solar pods”. At present, TransitX has no operational systems but claims to have a pod prototype, is building a test track, and has agreements to build in several areas, most notably rural Atlanta area (Henry County), but also the Philippines, Manila suburbs, Rwanda, and Ghana. TransitX has prepared a proposal for a network serving Madison and Sun Prairie. www.transitx.com.

As proposed, a Transit X PRT system would have the following characteristics:

- Light-weight pods for 4-5 people suspended from steel beams above the roadway
- Automated high-speed operation – direct service from origin to destination
- Stations where desired – pod comes down and picks you up
- Solar powered – pods and track are wrapped in solar film and tied into the grid
- Slim profile pole-and-beam track that fits within the public right-of-way
- “Fair fares” – mileage based fares comparable to public transit fares
- For profit enterprise – Transit X plans to recoup all capital and operating costs with no municipal investment
- High capacity compared to other modes
- Operational within a year or two
- MSG manufactures the fiberglass pods, motors are from a Chinese company, Arcadis does the civil design, and Altran does the vehicle guidance and software. Pods are assembled in Madison by Transit X.
- East Asia Capital Properties and the Jefferies Group provide financing, AON is their insurance carrier

Figure 1 Photo illustration of Transit X
Source: Transit X Handbook

2.0 Status of PRT

The concept of PRT (Wikipedia: “PRT, also referred to as podcars, is a public transport mode featuring small automated vehicles operating on a network of specially built guideways”) has been around for decades, yet few systems exist. The existing PRT systems generally have a specific routing function and have required dedicated running ways that use concrete guideways, rather than suspended – similar to rail or dedicated bus ways. They also typically have a closed loop, limited or no branching. The following bullets summarize the only operating systems.

- Morgantown, WV

  Built in the 1970s, rubber-tired autonomous 20-passenger vehicles operate on a 3-mile concrete guideway (back and forth) with 5 stations. This PRT system serves the University of West Virginia campus. Vehicles operate on demand, as opposed to using fixed schedules, and have the ability to skip stations. About 16,000 students use it daily.

Figure 2 Morgantown PRT
https://en.wikipedia.org/wiki/Morgantown_Personal_Rapid_Transit

- Suncheon SkyCube PRT, South Korea

  This is perhaps the project most similar to PRT as envisioned by Transit X. Elevated concrete structure with guided pods operating on top of it. However, it is strictly for users to go to and from a National Garden - it does not operate in an urban environment. The back and forth route is about 3 miles long. Average ridership is between 1,000 to 1,500 passengers per day.

Figure 3 Suncheon SkyCube PRT
https://kojects.com/2015/07/20/suncheon-skycube-prt-ride/

- Heathrow Airport – ULTra (Rapid Transit)

  First opened in 2011, ULTra consists of 21 pods operating on a 2.4 mile route. The pods operate on an elevated concrete structure connecting the terminal with a parking ramp. This system does allow the pods to take multiple routing options. Ridership was not available.

- Masdar City, Abu Dhabi

  Phase 1 of Masdar’s PRT is about 0.9 miles long and was constructed in 2010. It has 2 stations and links a parking lot with the Masdar Institute for Science and Technology. It is an on-demand system

with 10 automated steered pods that operate on a concrete guideway. The project has not been expanded.

Figure 4 Masdar PRT
https://www.2getthere.eu/masdar-city-prt/

Table 1 below shows PRT manufactures that make similar products to Transit X, as well as internet research relating to their accomplishments. The list was compiled from a 2014 Mineta Institute paper on Automated Transit Networks, the Advanced Transit Association, and other sources. There are likely more companies that have made similar proposals as the PRT concept has been around since the 1960s.

Table 1 Compilation of PRT Systems

System	Summary of system
2getthere	Short route, low-speed driverless vehicles on roadways in Rivium and the Masdar City system, possibly a few other similar implementations in airports, universities, and theme parks
ULTra	Automated pods on dedicated roadway, Heathrow Airport, planned similar system in India
Vectus	Elevated track, Suncheon system, website appears defunct
ModuTram	Elevated beam, test track in Guadalajara
Beamways	Suspended beam, nothing built
BubbleMotion	Aerial beam, no internet presence, nothing built
Cabinentaxi	Aerial and suspended track from the 70's, nothing built besides a test track
CyberTran	Aerial track, no internet presence, nothing built
ROAM Transport	Aerial track, nothing built
SkyCab	Aerial track, studies in Sweden, nothing built
TriTrack	Aerial beam, nothing built
Taxi2000	Aerial track, also called Skyweb Express, plans/studies in the 80s and 90s, nothing built
Swift Tram	Suspended beam, nothing built
Skytran	Suspended track, nothing built
Swedetrack	Aerial beam, no internet presence
PRT International	Aerial track, no internet presence
JPods	Suspended track, nothing built
Boeing	Morgantown system built in the 70s
Austin PRT	Elevated track, similar claims to Transit X, renderings look similar to ULTra
Spartan Superway	Suspended track in development at San Jose State, extremely similar to Transit X
Hyperloop	Elevated long-distance vacuum tube proposed by Elon Musk in 2013, despite much investment, interest, and hype, nothing has materialized other than a test track in the desert and a prototype capsule; not PRT but similar claims

3.0 Comparing PRT with Automated Guided Transit

Automated Guided Transit (AGT) is a similar technology to PRT. It uses similar infrastructure, but uses automated short trains instead of small personal pods. AGT has achieved widespread implementations at airports, including O'Hare and Minneapolis-St Paul International. Oakland's and New York City's (JFK) airports use new public AGT systems connected to their regional rail systems, BART and the NYC Subway. A few public general purpose AGT systems are in operation such as Miami's People Mover and a small free system in the Las Colinas Business Park in Dallas.

Figure 5 The AirBART Automtated Guided Transit system.
Source: Oakland Airport

AGT has succeeded where PRT has failed because trains that are larger than small pods have higher capacity, are more efficient to operate and schedule, and do not rely on many automated switches that operate at high speed and many small stations. They have essentially the same guideway infrastructure requirements. With automation, shorter trains with headways of a few minutes are possible achieving very short wait times similar to what PRT could realistically provide. AGT has not been widely implemented in urban environments, however, because it does not have the ability to run at grade, making light rail a lower cost competitor.

4.0 Transit X Capabilities

Mike Stanley is both the owner and founder of Transit X. He has recently stepped down as CEO, with no one yet taking his place. Transit X was founded in 2015 and has had agreements with several municipalities to build and operate podcar systems and that it would have 10 operational cities by 2020 according to their submitted materials. It appears that Transit X has not yet built, or planned anything beyond a prototype track and pod and a design handbook. The prototype section includes an example of Transit X pods hanging from a rail is on a 40-foot-long test section inside a building in Leominster, MA. Transit X indicated that they would be starting construction on a system in United Arab Emirates later this year. A web search revealed their proposal to UAE, but no other information.
A web-search did not provide information regarding projects actively being implemented. There have been newspaper articles with public officials stating interest in the system – particularly five municipalities near Atlanta GA. Officials in Henry County (Atlanta area) and several south side cities agreed in recent months to negotiate access to public rights of way along roads for a future Transit X system. Staff discussions with Transit X indicated that they are in contact with one Henry County commissioner but they have not made contact with city staff –despite media articles stating they would have a 36-mile system built and operational by around 2020. Recent articles in the Atlanta Journal-Constitution indicate that some communities in Henry County are

no longer considering Transit X because of recently revealed background information regarding the owner.

5.0 Proposed Transit X Madison Plan

Transit X provided a plan for Madison WI and it can be located at: www.transitx.com/proposals/Transit_X_for_Madison,WI.pdf. The following figure illustrates the network for Madison.

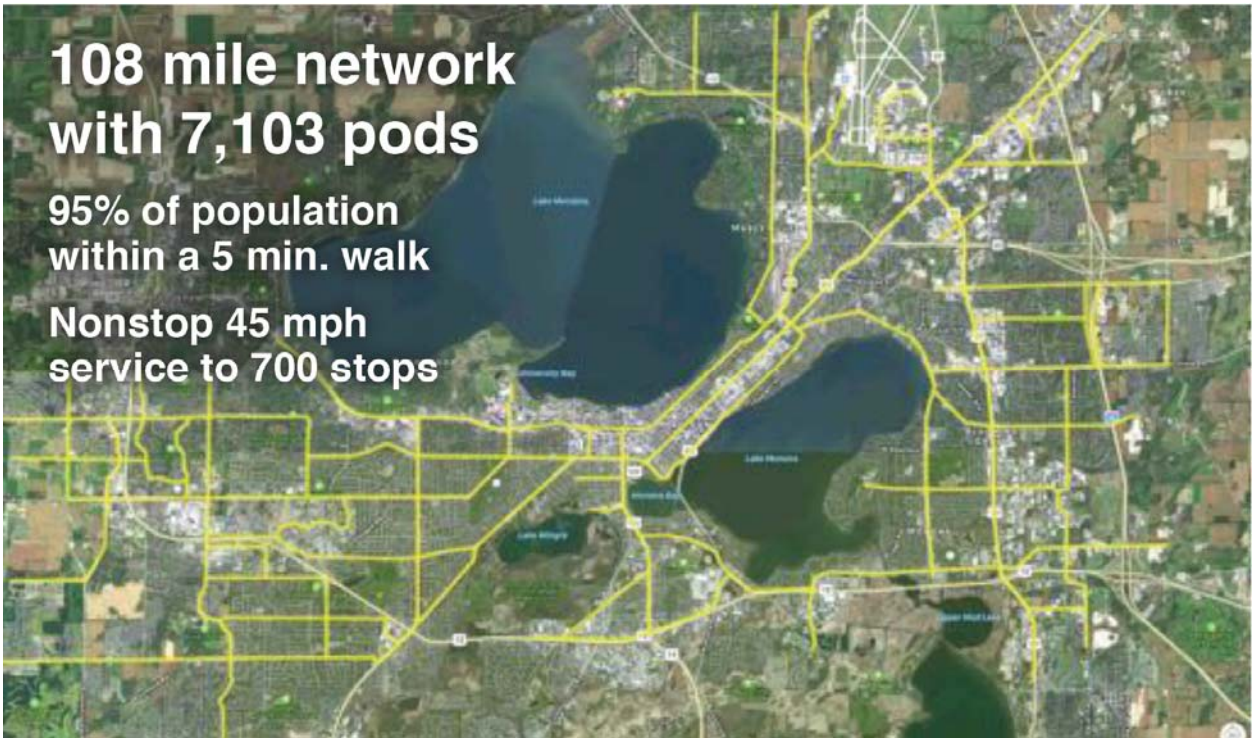

Figure 6 Proposed Madison Transit X System

Key characteristics of the proposed system include (from the Transit X proposal):

Length:	108 miles
Number of pods:	7,100
Cost:	$690 million
Ridership needed to break even:	48,000 passengers per day (~ total Metro daily ridership)
Top speed	45 mph
Estimated yearly debt service and fees	$125 million (2.3 times Metro cost)
Annual operating costs:	Not included in cost analysis
Revenue sharing with Madison:	$42 million annually.

The proposal would require that Madison enter a Memorandum of Understanding that would grant air rights, as well as an operating agreement. The buildout of the system would start with a 2 to 4 mile pilot project implemented within 24 months, with full buildout of the system later.

6.0 Transit X Challenges

A. Scale

Transit X is proposing a PRT system for Madison that is 20 to 50 times greater than any other existing PRT in the world. And it is being proposed by a company that does not have a successful implementation history of any PRT system.

B. Timeframe

Transit X probably greatly underestimates the time required to implement a system. A road project of a mile or two, such as Johnson Street or Williamson Street intersection, which use existing right of way, generally requires about 3 years to implement. A project that is fundamentally different in transportation mechanisms, methods, and without precedent for utility conflicts, is likely to take much longer than the stated 24 months to implement.

C. Air Rights

Obtaining air rights may present challenges. Micro-cell carriers have been requesting rights to erect poles and/or use city poles within City right-of-way. This has resulted in a lengthy process for granting rights – despite it being mandated by the FCC. It is unlikely air rights on the scale required by Transit X could be granted in a timeframe needed for implementation, given likely concerns raised by residents and businesses. Transit X has stated that they would provide Air Rights agreements that they have negotiated with other communities, but they are still forthcoming.

D. Aesthetics

The installation of a track with flying pods may raise concerns among residents. Perhaps greater concerns may arise in complying with Section 106 (historic) laws, which help protect the setting of properties that could be eligible for the National Register of Historic Places. It is unclear, given this is a private and not a public action, how these laws would apply. If this was a typical project involving Federal monies, the Section 106 approval effort could easily take years.

E. Finances

Virtually no transit systems turn a profit, and the few that do, such as Amtrak's Northeast Corridor between Boston and Washington, DC, only do if one ignores capital costs. Transit X proposes to build the system for free at about $5-7 million per mile and return some of the operational revenue to the city while at the same time paying off its capital debt and making a profit. It is likely that Transit X is overestimating revenue and underestimating the costs needed to run and maintain the system.

F. Risk and Liability

Transit X has AON as their insurance carrier. Staff have requested insurance limits and indemnification clauses they have used on other projects. While agreeing to provide this information, it is still forthcoming.

Typically motor vehicles and other manufactured goods have testing certifications, either by American Society for Testing and Materials (ASTM) and/or by National Highway Traffic Safety Administration (NHTSA). When asked about their certifications, Transit X stated they would pursue these testing requirements once a system was implemented. It is likely that these certifications could take years to obtain.

G. Utility Conflicts

Many utilities occupy air rights in similar spaces that Transit X would occupy. When asked how they handle these conflicts, Transit X indicated that they were in discussions with Georgia Electric, but did not want to share details because of copyright concerns.

H. Pod Traffic Assignment

Pods will be traveling on tracks at up to 45 mph and will encounter intersections with other pod routes – presenting potential conflicts. Staff asked about how they handle pod travel prioritization when pods approach an intersection. Transit X indicated that Altran is preparing their vehicle guidance software. They did not indicate if it was similar to other traffic control systems used on roadways. It is likely that a system of the proposed size for Madison would require considerable development and testing.

I. Americans with Disabilities Act Considerations

Typically when a wheelchair user enters a bus, the bus driver helps the wheelchair passenger load and anchors the wheel chair to the bus with straps. When asked how Transit X would address passengers with wheelchairs, they stated that they planned to passengers lock the wheel chair in manually, but intend to have it automated in the future. When looking at the pod design presented in their materials, it is unclear how a wheel chair would fit into a pod.

J. Structural Feasibility

The track is a proposed one-foot-wide guideway supported by vertical poles, described as similar to telephone poles – unobtrusive, simple, and inexpensive. The pods are small and light-weight. However, it is unlikely that a pod that seats 4-5 people and accommodates wheelchairs and freight will be significantly lighter than a car without compromising safety. Therefore aerial structures would likely need to be of similar design to other transportation systems to support the weight and lateral forces as opposed to telephone poles. A more relevant example would be the Modutram test track and station in Guadalajara, which uses a design similar to a roller coaster. This is much more substantial than what Transit X has proposed. It would not fit unobtrusively in a terrace and would likely have much higher capital costs.

Figure 7 Example of Structure Supporting Pods
Source: Modutram

7.0 Staff Recommendations

Madison DOT staff recommend continuing the pursuit of BRT implementation while monitoring Transit X progress in other communities. Reasons for this recommendation include:

- The scale of Transit X's proposal is 30 to 50 times greater than any other operating PRT in the world. Staff do not believe it is feasible to easily and quickly scale up a PRT system rapidly.
- Transit X has no history of successful PRT implementation. Staff do not feel it is worth the risks to partner with an untested company and system.
- Staff believe that Transit X has greatly underestimated the challenges associated with implementation, including:
    - Obtaining relevant air rights approvals are likely to be much more difficult than anticipated.
    - Addressing utility conflicts poses a much greater problem that is likely to increase project costs substantially.
    - Capital financing for a project costing almost $700 million without some type of surety is highly unlikely.

If Transit X is successful in his implementation of a system, the evidence should be available by the end of 2020 with projects at least committed if not under construction or operational. BRT construction is not planned until 2022. Staff believe it will be to our advantage to let this technology mature if it succeeds where similar PRT endeavors have failed.