



- ATN Description
- Existing Systems
- Stations and Guideways
- Characteristics
- PRT Consulting

- Automated transit networks (ATN)
  - Group rapid transit (GRT)
  - Personal rapid transit (PRT)





## Group Rapid Transit (GRT)

- Driverless vehicles on a guideway
- Twenty to fifty seated/standing passengers
- Offline stations (on sidings)
  - Few intermediate stops
- Service on demand – not scheduled
- Short headways (seconds)



- Driverless vehicles on a guideway
- One to six seated passengers plus luggage
- Direct origin to destination service
  - No need to transfer or stop
- Service on demand – not scheduled
- Very short headways (seconds)





# Automated Transit Networks (ATN)

- GRT and PRT can operate on separate infrastructure
- Or on the same infrastructure



- Can attract drivers
  - Has little or no waiting
  - Provides service with few stops
- Low infrastructure needs
  - Costs less to build and operate
  - Relatively easy to retrofit
- Is 10 times safer
- Uses much less energy
- No on-site emissions
- Can also carry freight



## Open Guideway (2getthere)

Vehicle steers itself



## Captive Bogey (Vectus)

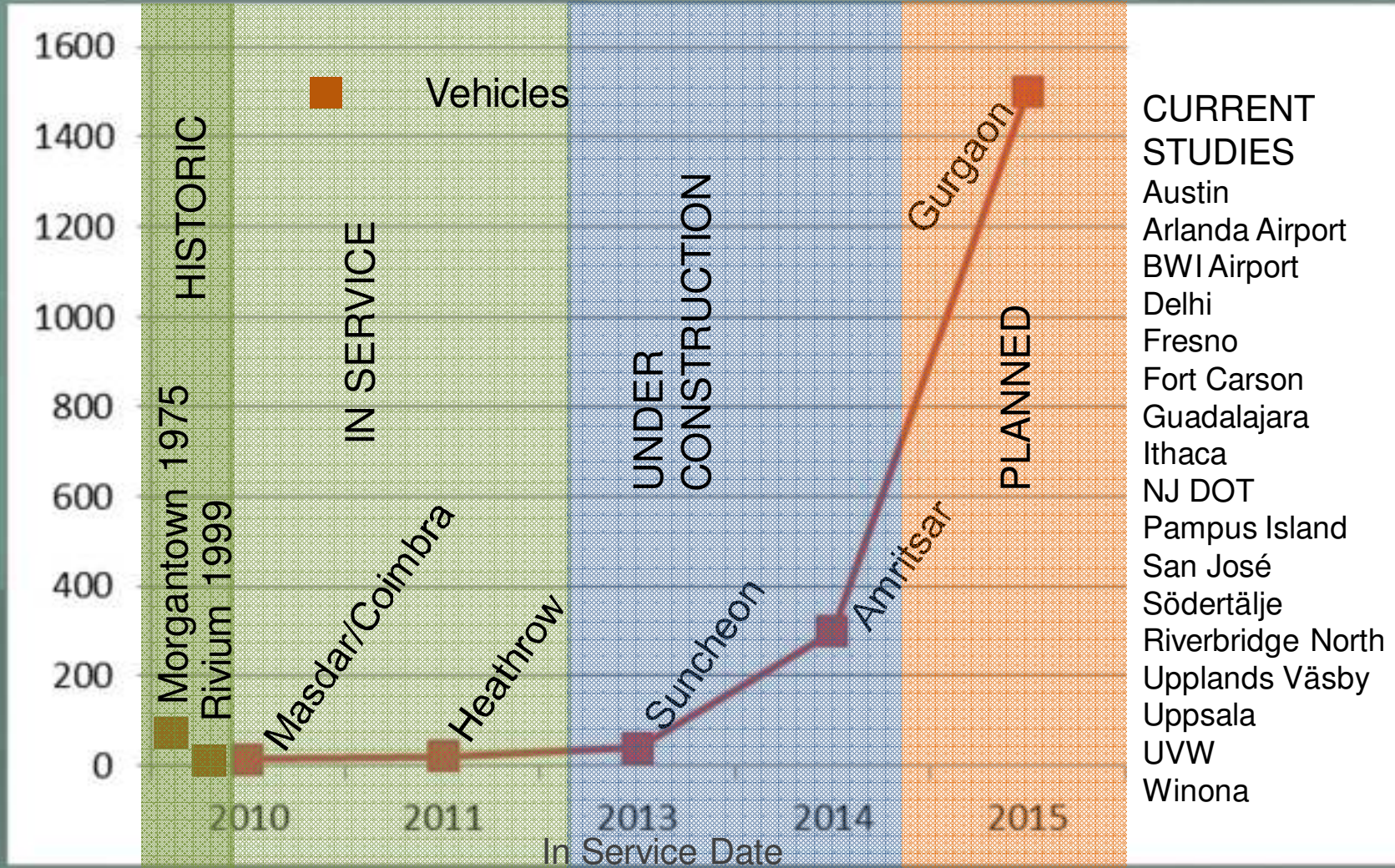
Guideway steers vehicle

## Suspended (Mister)

Vehicle hangs from, and is steered by guideway







- 2getthere
- Vectus
- ULTra
- Morgantown



- Vehicles carry 4 – 20 passengers
- Max. speed = 25mph (40 km/h)
- PRT Capacity up to 2,500 pphpd
- GRT Capacity up to 12,000 pphpd
- Automated operations since 1997
- Masdar PRT Project operating since 2010



# 2getthere Rivium GRT System





# 2getthere Masdar PRT Vehicle







- Subsidiary of POSCO
- Test track in Sweden
- Swedish safety certification
- Suncheon Project (2013)



- Linear induction motors
- Good all-weather capability
- Capacity up to 5,000 pphpd
- 43 mph (70 km/h)





- Linear induction motors
- Good all-weather capability
- Capacity over 10,000 pphpd
- Under development



- 2,650 lb gross weight
- 25 mph (40 km/h)
- 2KW continuous battery power
- Heathrow public operation since April 2011
- Rave passenger reviews





## ULTra System Features

- Footbridge-like elevated guideway
- 4 passengers
- PRT capacity up to 2,500 pphpd



- In operation since 1975
- 15 second headways
- 5,000 pphpd
- Intermediate stations are bypassed
- 98.5% availability (Transit LOS A)
- 140 million injury-free passenger miles





- Speeds up to 30mph (48 km/h)
- 10% maximum gradient
- Capital cost (\$126M) overran budget
- Operating cost \$3.3M/year (\$1.50/passenger, \$0.94/passenger mile)
- 6 additional stations being planned





[Link to YouTube version](#)



- ATN stations are typically smaller (even for same capacity)
- Sized according to demand
- Tight radii (15' (5m)) and steep (10%) gradients add to flexibility





# ULTra at Grade









# Vectus Elevated/At Grade





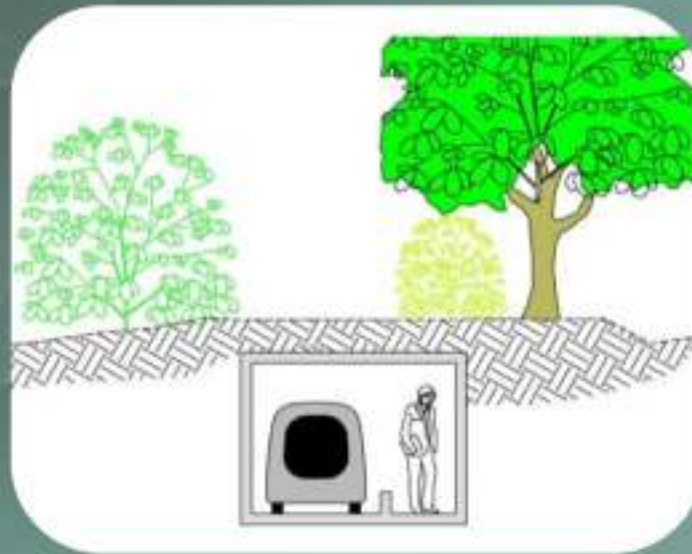


# Morgantown GRT Station





# Guideway Concepts







# ULTra Guideway at Heathrow



# T2K Guideway Rendering





- Level of service
- Transit mode share
- Capital costs per mile
- Operating cost per passenger
- Capacity
- Energy use
- Emissions
- Viability

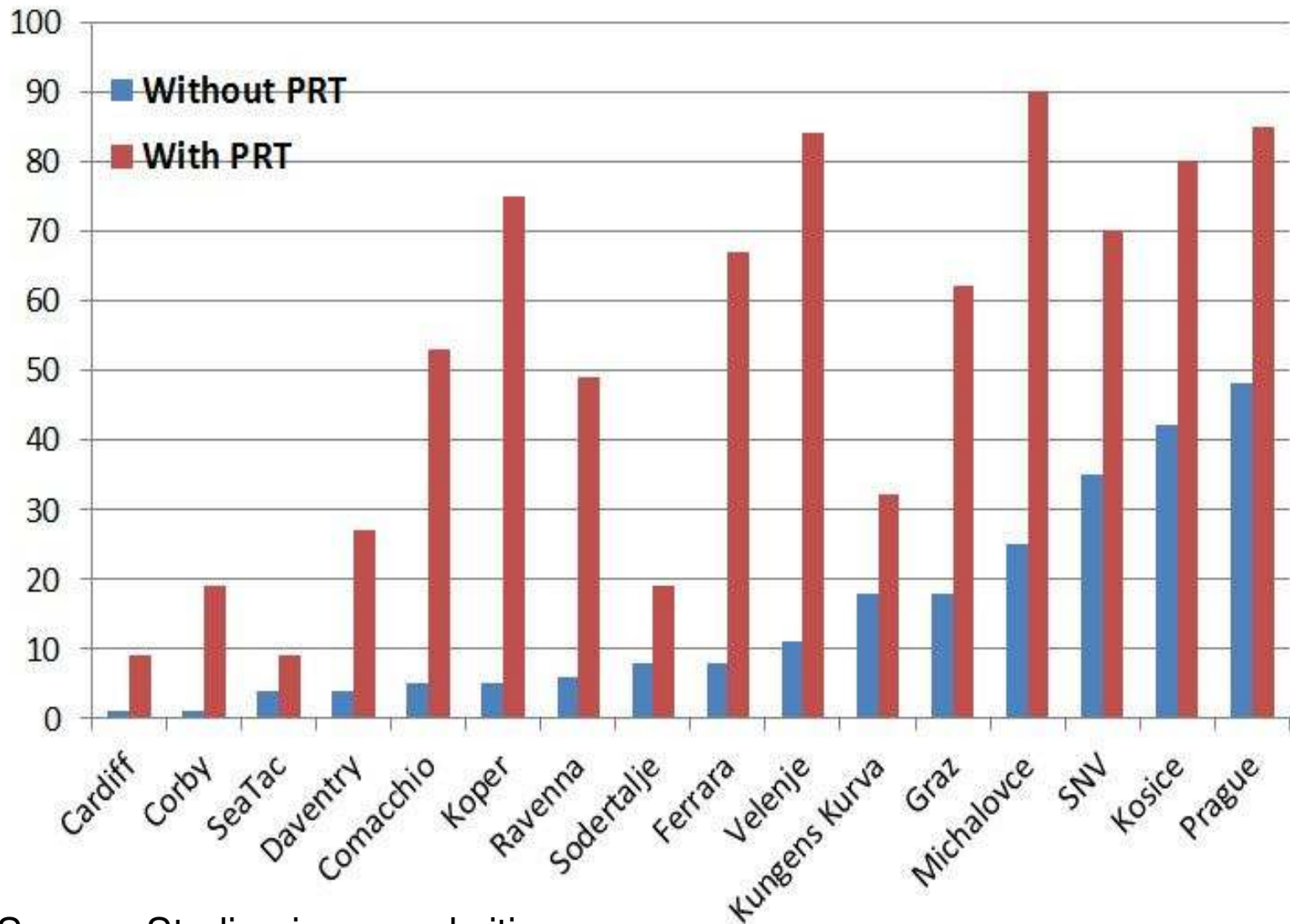
# Level of Service Comparison

	Transit	Car	PRT	GRT
System reliability	⦿	⦿	✓	✓
Trip time	✗	⦿	⦿	⦿
Cost per passenger	⦿	✗	✓	✓
Minimal walking	✗	✓	⦿	⦿
On-demand 24/7	✗	✓	✓	⦿
Transfers	✗	✓	✓	✓
Guaranteed seat	⦿	✓	✓	⦿
Handicap provisions	⦿	✗	✓	✓
Safe and secure	✗	✗	✓	✓
Private	✗	✓	✓	⦿
Non-stop	✗	✗	✓	⦿
Snow & ice	⦿	✗	⦿	⦿

Good ✓    Acceptable ⦿    Poor ✗

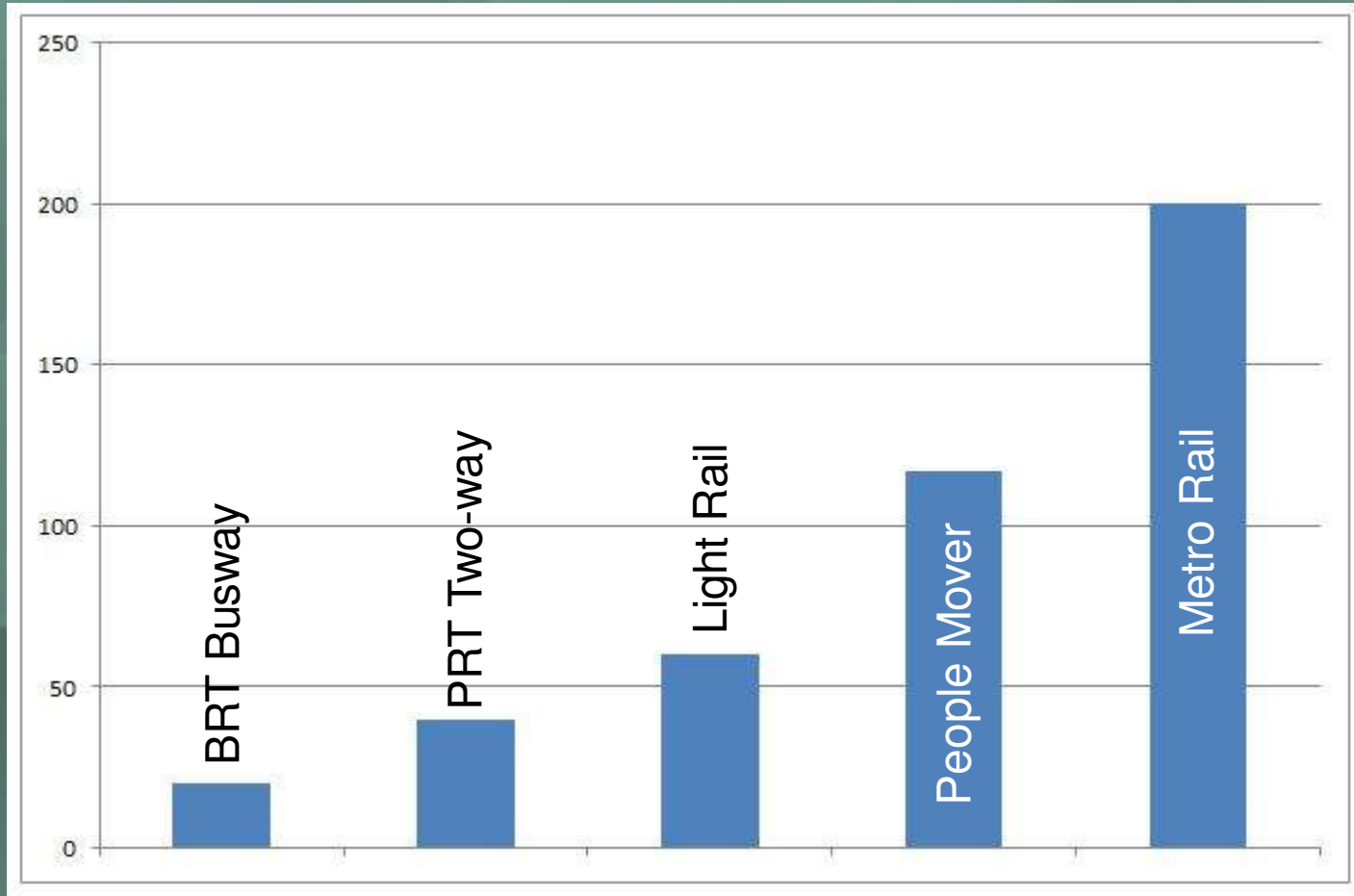


# Transit Mode Share Percent



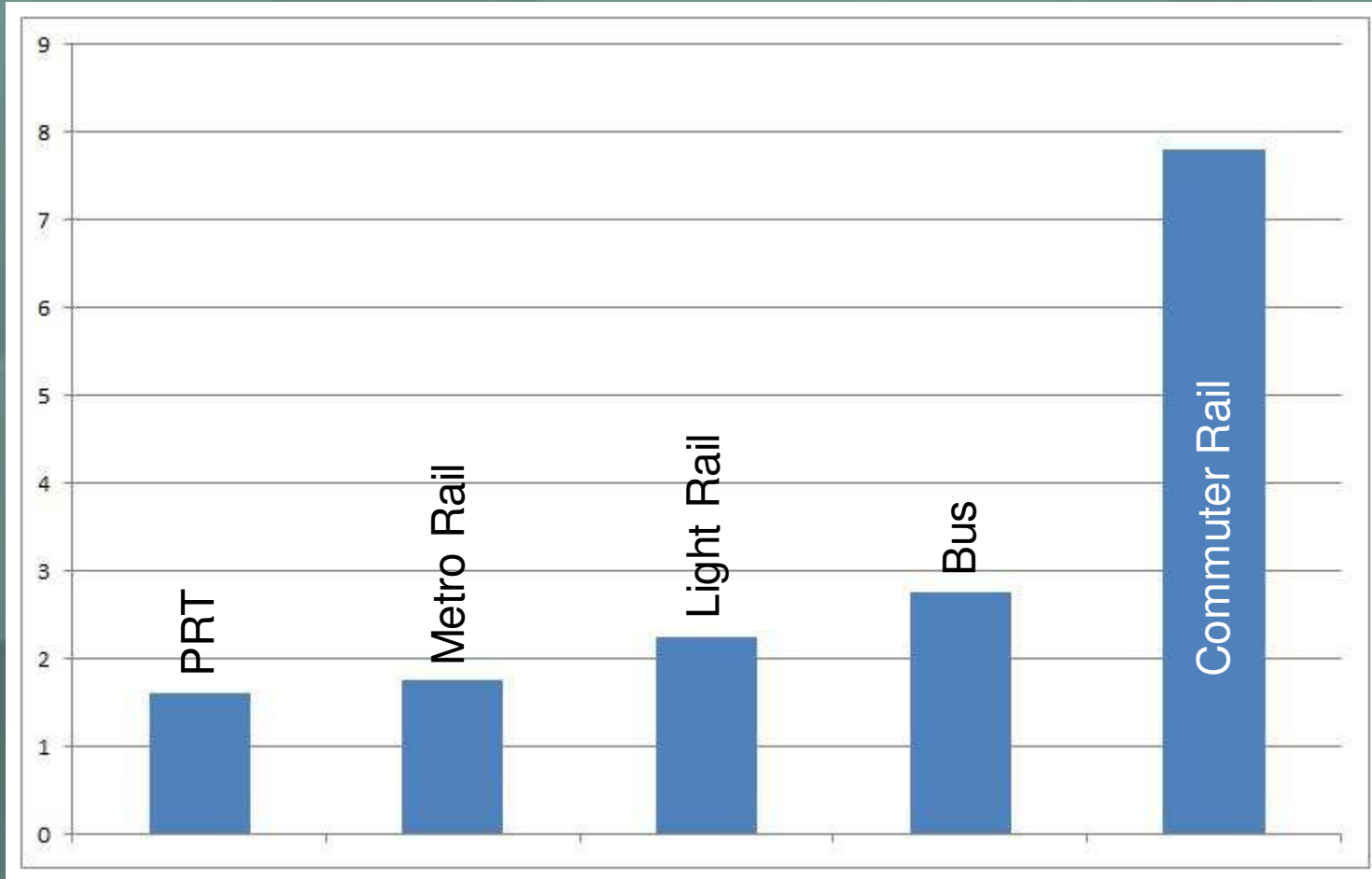
Source: Studies in named cities

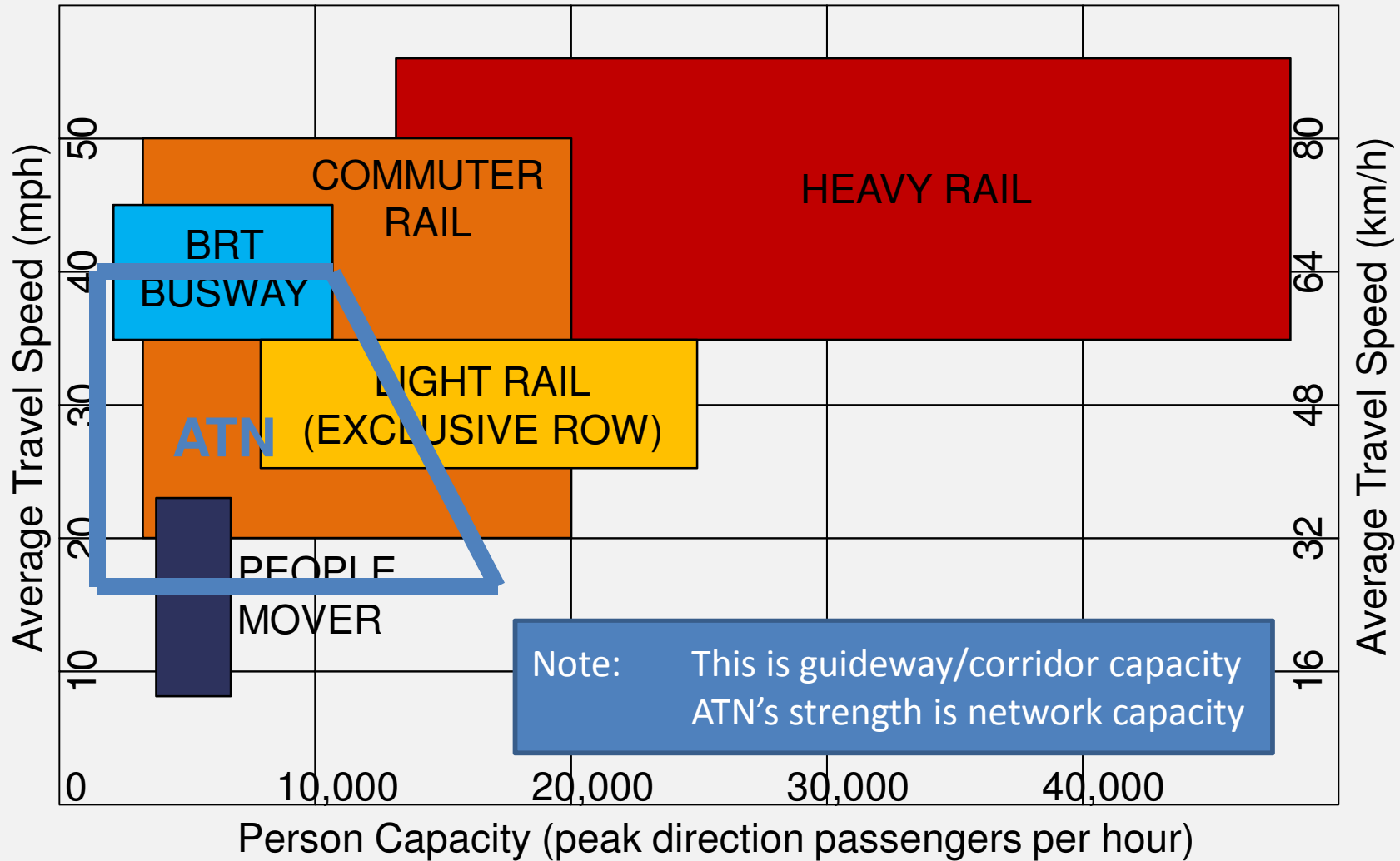
# Capital Cost per Mile (\$M)



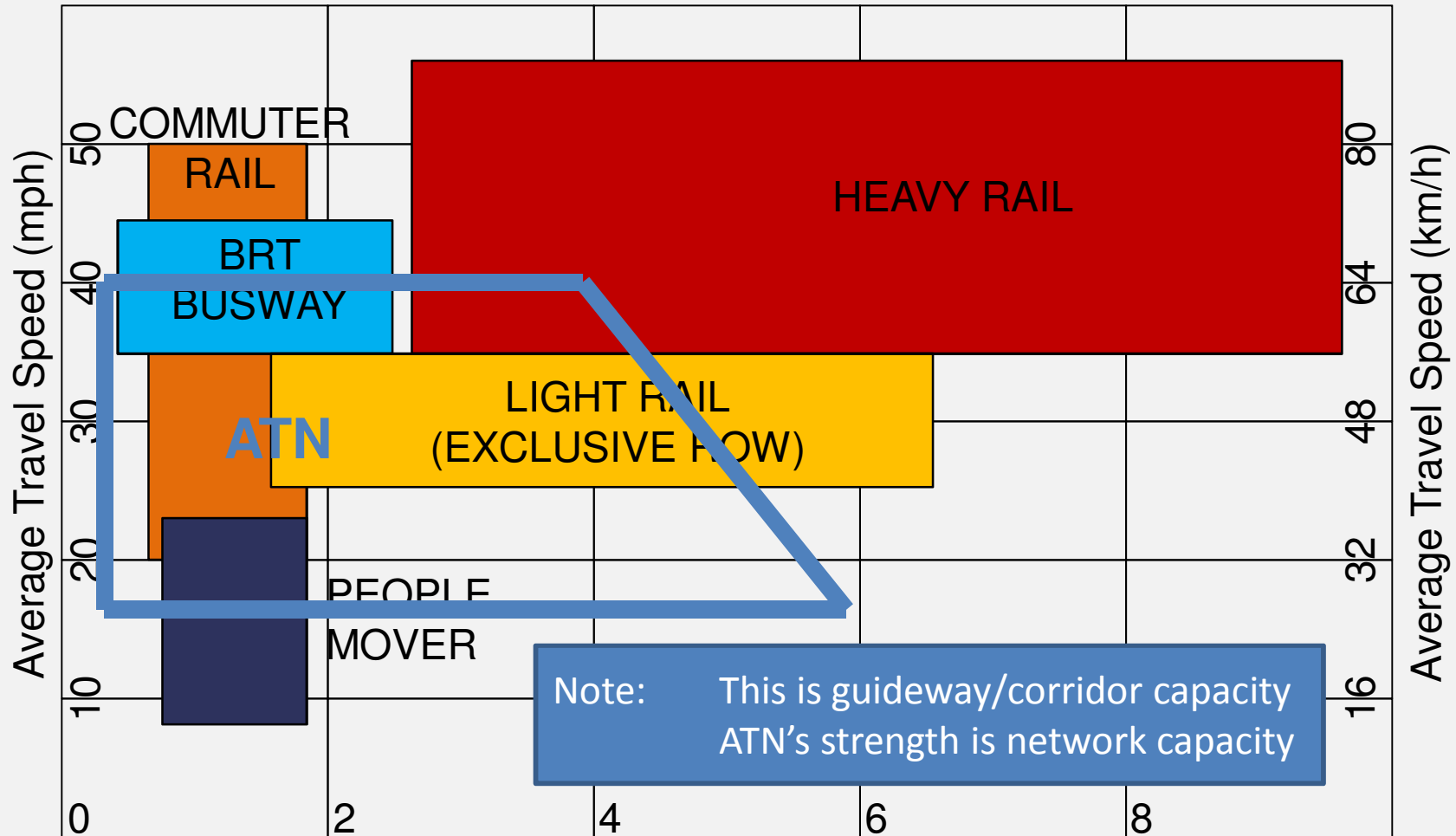


# Operating Cost (\$ Per Passenger)







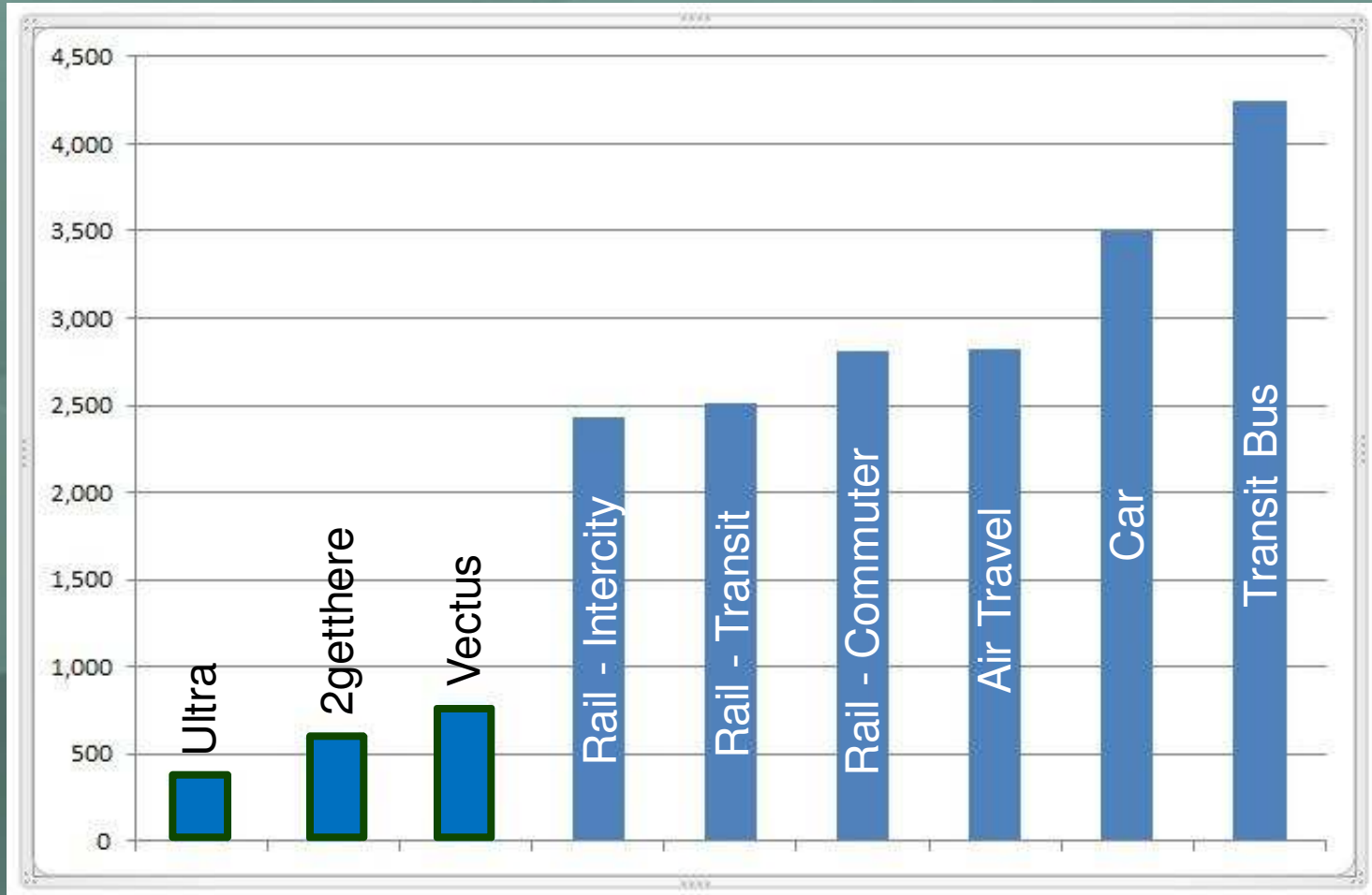


Note: This is guideway/corridor capacity  
ATN's strength is network capacity

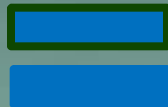
Relative Person Capacity Per Dollar Capital + Operating Cost

Sources: TCRP Report 100 Transit Capacity and Quality of Service Manual, PRT Consulting

# Energy Use (BTU Per Passenger Mile)



Sources: PRT Vendors  
USDOT





- No point-of-use emissions
- Power from the grid

- ULTra
  - Public service at Heathrow Airport since early 2011
  - BAA is major stockholder
  - Amritsar, India, 2014 (PRT)
  - Gurgaon, India, 2015 (PRT)
- 2getthere
  - Ten-year track record with similar systems in Holland
  - Public service in Rotterdam 1999 (GRT)
  - Public service in Masdar 2010 (PRT)
- Vectus
  - Subsidiary of Posco
  - Certified by Swedish Rail Authority
  - Suncheon S. Korea 2013 (PRT)



- Professional engineering and planning consultancy
- Specializing in ATN since 2005
- Three subject matter experts with over 10,000 hours ATN experience each
- Specialized ATN simulation modeling tools
- Independent of all ATN suppliers



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