



# Strategic Fleet Planning



Amtrak's Approach to Re-fleeting - Planning for the next generation of State Service Corridors

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September 2018

# Contents

- Equipment History
- Amtrak's Fleet Strategy Principles
- Planning Horizon
- Amtrak's Current Fleet, Summer 2018
- Current Daily Fleet Needs
- Rail Corridor Network 2030
- Recent Fleet acquisitions & acquisitions underway
- Priorities
  - Diesel Locomotive Replacement
  - Amfleet I Replacement – Train-sets and MUs
- Time Line
- Key Stakeholders – Engagement, Input, Planning

# Some Equipment History...



Photo courtesy of Phil Gosney

In the beginning (May 1971) Amtrak inherited equipment from predecessor railroads that was known as the “Rainbow Fleet”

In 1973, Amtrak ordered 492 Amfleet I coaches from the Budd Company



Don O'Brien, Creative Commons



# Some Equipment History...



Amtrak

GE Genesis (P42 and others) locomotives were built for Amtrak and other railroads starting in 1993

In 1974, Pullman Standard won the contract for 284 new bi-level Superliner cars.

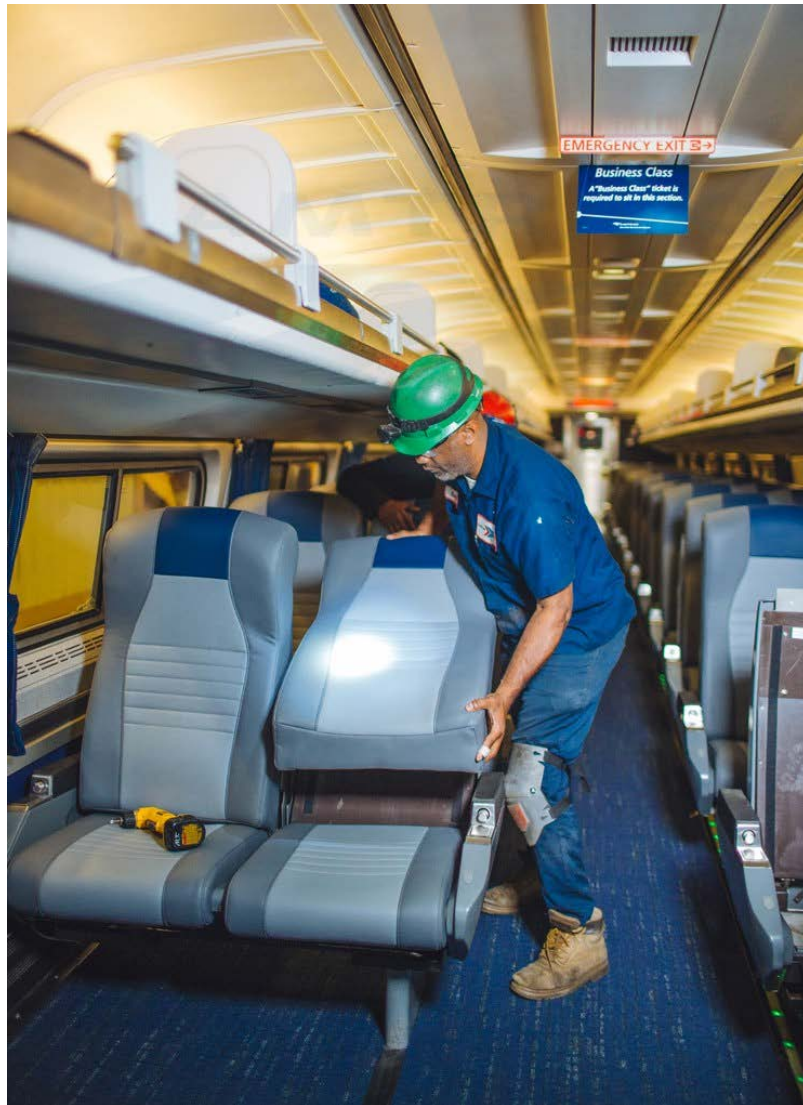
In 1991, Amtrak ordered an additional 195 Superliner II cars from Bombardier



Don O'Brien, Creative Commons



# Next Generation of Equipment



Installing new seat Amfleet cushions  
in 2017, 44 years after Amfleets  
were first ordered

- Even with overhauls and refreshes, it is time to think about the next generation of equipment.
- Over the years, many changes in passenger rail and rolling stock technology to consider when selecting new equipment.
- For some applications, locomotives hauling individual coaches may be the best solution, but other approaches may be less expensive and provide a better service.

# Fleet Strategy Principles

- Convert fleet to modern, efficient equipment as core of Amtrak product
- Maximize off-the-shelf, proven products; minimize customization
- Require vendor supply equipment in turnkey condition; avoid retrofit of new equipment
- Standardized designs & equipment - at most 3-4 general fleet types:
  - Diesel locomotive solution
  - Configurable single-level trainset solution:
    - i. *Unpowered Locomotive-hauled trainsets for longer consists*
    - ii. *MU & DMUs for shorter consists*
    - iii. *Powered trainsets*
  - Multi-level car solution

# Fleet Strategy Principles

- Utilize performance-based specifications to enable proven vendor solutions
- Meet requirements of Americans with Disabilities Act (ADA)
- Meet goals of Amtrak Sustainability Plan, emphasizing environmental sensitivity and carbon footprint; meet EPA Tier 4 Emissions standards
- Order minimum foreseeable quantities with remaining additional units for Service and Network growth as options
- Expand capacity on high-density corridors
- Dual-power solutions - eliminate time-consuming engine changes

# Fleet Strategy Principles

- Focus on:
  - Safety
  - Customer amenity and appeal (i.e. effective Wi-Fi solution, seating configuration, bathroom design, open gangways)
  - High performance: Acceleration, ride-quality and emissions
  - Ease of operation, reduced turnaround times: double-ended trainsets
  - High-reliability and availability for service through state-of-the-art diagnostics, integrated engineering and maintenance practices
  - Head End Power draw for fuel and electric power efficiency
  - Configurability
- Configuration and quantities to be adjusted to conform to long-range network strategy



# Planning Horizon

- FAST Act Asset Line Plans
  - Requires a five year outlook for Amtrak Business Service Lines
  - Due February 2019
- Amtrak Internal Strategic Fleet Plan
  - Ten year outlook
  - Completion goal end of CY2018

- 
- Typical locomotive / high-speed trainset service life: 20 years
  - Typical conventional railcar service life: 20-40 years

# Amtrak's Current Fleet - Summer 2018

Equipment Type		Active Units	Avg Yr Built	Average Age	Notes
<b>WHOLLY AMTRAK OWNED/LEASED FLEETS</b>					
Acela Express	Trainset Units	161	1999	19	Twenty sets of six passenger cars + two power cars, plus one inspection car
ACS-64	Locomotives	67	2014	4	
P32ACDM	Locomotives	18	1996	22	
P-40	Locomotives	13	1993	25	
P-42	Locomotives	187	1998	20	Ordered in batches from the mid-1990s through early 2000s
F59PHI	Locomotives	21	1998	20	To be returned to lessors following replacement by state-owned Chargers
Amfleet I	Cars	457	1976	42	
Amfleet II	Cars	139	1982	36	
Viewliner I	Cars	49	1996	22	
Viewliner II	Cars	90	2015	3	
Superliner I	Cars	242	1980	38	
Superliner II	Cars	184	1995	23	
Metroliner	Cars	16	1967	51	
Heritage	Cars	3	1954	64	
Non-Powered Control Units	Cars	19	1977	41	Rebuilt from former F-40 locomotives, used for baggage and cab control stand
Auto Train Auto Carriers	Cars	80	2005	13	
Horizon	Cars	92	1989	29	
<b>WHOLLY STATE-OWNED FLEETS OPERATED BY AMTRAK</b>					
Charger Locomotives	Locomotives	41	2017	1	
California F59PH/F59PHI/P32-8	Locomotives	17	1996	22	
NCDOT F59PH/F59PHI	Locomotives	8	1991	27	
California I	Cars	66	1996	22	
California II	Cars	12	2002	16	
California ex-Comet	Cars	14	1986	32	Build date shown is the rebuild date for these cars by NJ TRANSIT
NCDOT Cars	Cars	20	1961	57	
<b>SPLIT OWNERSHIP BETWEEN AMTRAK AND STATE PARTNERS</b>					
Talgo	Trainset Units	80	2004	14	All units were either built in 1999 or 2013; 2004 is a weighted average
Surfliner	Cars	49	2000	18	

**TOTAL** 2145 units

**Wholly Amtrak-Owned/Leased Fleets** 1838 units

**Average Amtrak-Owned Locomotive Age:** 16.8 years

**Average Amtrak-Owned Railcar Age:** 32.4 years

# Amtrak's Current Daily Fleet Needs - 2018

	Existing Fleet Requirements																	
	Locomotives				Railcars										Trainsets			
	ACS-64 Loco	P-40/P-42	Dual Power Loco	State Owned Loco	Amfleet I	Amfleet II	Metroliner	Horizon	Viewliner	Viewliner Baggage	Superliner	Surfliner	State-Owned	NPCU	HS Sets	HS Units	Talgo Sets	Talgo Units
NEC	24	6	-	-	193	-	-	-	-	-	-	-	-	-	16	128	-	-
State-Supported	13	21	12	53	174	16	11	65	-	4	20	40	76	14	-	-	6	77
Long Distance	4	91	2	-	15	98	-	-	53	54	315	-	-	-	-	-	-	-
Protect, Shop Margin, Training	21	60	4	28	70	27	6	27	14	13	52	9	36	9	4	32	-	-
Total	62	178	18	81	452	141	17	92	67	71	387	49	112	23	20	160	6	77

NOTE: Figures adjusted from CNOC requirements sheets to show the completion of Charger deliveries and P-42 replacement on corresponding corridor routes.

Viewliner figures based on 64 delivered sleeper + dining cars as of March 2018; Virginia and 140-series trains included under NEC but operate on NEC + State thru services



# Typical State-Supported Service Fleet Needs

	Locomotives				Railcars									Trainsets	
	ACS-64 Loco	P-40/P-42	Dual Power Loco	State Owned Loco	Amfleet I	Amfleet II	Metroliner	Horizon	Viewliner Baggage	Superliner	Surfliner	State-Owned	NPCU	Talgo Sets	Talgo Units
<i>Daytime Northeast Regional (incl. 140-series, VA trains)</i>	24	6	0	0	193	0	0	0	0	0	0	0	0	0	0
<i>Overnight Northeast Regional (Nos. 66, 67)</i>	2	1	0	0	10	0	0	0	2	0	0	0	0	0	0
<i>Carolinian</i>	1	2	0	0	12	0	0	0	2	0	0	0	0	0	0
<i>Piedmont</i>	0	0	0	2	0	0	0	0	0	0	0	6	0	0	0
<i>Vermont</i>	1	4	0	0	11	0	0	0	0	0	0	0	0	0	0
<i>Empire/Ethan Allen</i>	0	0	10	0	54	0	0	0	0	0	0	0	0	0	0
<i>Maple Leaf</i>	0	2	1	0	2	6	0	0	0	0	0	0	0	0	0
<i>Adirondack</i>	0	2	1	0	7	4	0	0	0	0	0	0	0	0	0
<i>Shuttles</i>	0	3	0	0	3	0	3	0	0	0	0	0	0	0	0
<i>Downeaster</i>	0	3	0	0	15	0	0	0	0	0	0	0	3	0	0
<i>Keystone</i>	8	0	0	0	32	0	8	0	0	0	0	0	0	0	0
<i>Pennsylvanian</i>	1	2	0	0	6	6	0	0	0	0	0	0	0	0	0
<i>Hiawatha</i>	0	0	0	2	4	0	0	8	0	0	0	0	2	0	0
<i>Pere Marquette</i>	0	0	0	1	0	0	0	0	0	3	0	0	1	0	0
<i>Wolverine Service</i>	0	0	0	4	4	0	0	11	0	0	0	0	0	0	0
<i>Blue Water</i>	0	0	0	2	2	0	0	4	0	0	0	0	0	0	0
<i>Illini/Saluki</i>	0	0	0	2	2	0	0	6	0	0	0	0	0	0	0
<i>Illinois Zephyr/Carl Sandburg</i>	0	0	0	2	2	0	0	6	0	0	0	0	0	0	0
<i>Missouri River Runner</i>	0	0	0	2	2	0	0	4	0	0	0	0	0	0	0
<i>Lincoln Service</i>	0	0	0	4	4	0	0	16	0	0	0	0	0	0	0
<i>Hoosier State</i>	0	1	0	0	1	0	0	2	0	0	0	0	0	0	0
<i>Heartland Flyer</i>	0	1	0	0	0	0	0	0	0	3	0	0	1	0	0
<i>Amtrak Cascades</i>	0	0	0	7	0	0	0	0	0	0	0	0	4	6	77
<i>San Joaquins</i>	0	0	0	8	0	0	0	2	0	2	0	34	2	0	0
<i>Capitol Corridor</i>	0	0	0	8	0	0	0	0	0	4	0	36	0	0	0
<i>Pacific Surfliner</i>	0	0	0	9	1	0	0	6	0	8	40	0	1	0	0
<b>STATE-SUPPORTED TOTAL</b>	<b>11</b>	<b>20</b>	<b>12</b>	<b>53</b>	<b>164</b>	<b>16</b>	<b>11</b>	<b>65</b>	<b>2</b>	<b>20</b>	<b>40</b>	<b>76</b>	<b>14</b>	<b>6</b>	<b>77</b>

# 2018 State Supported Equipment Status by Region

## Cascades

- 8 Charger order
  - 8 delivered to date, 7 in service
- Talgo shortage
- Talgo maintenance contract expires 2019

## Chicago Hub

- 33 Charger order by IL, MI, WI, MO
  - 21 delivered to date
- 88 Siemens order by IL, MI, MO
- Expected delivery begins 2020
- Siemens car order sufficient for current service but little room for growth

## NEC Branch Lines

- State Supported service tightly integrated with NEC (VA, CT/MA) or dedicated trainsets interchangeable with NEC (NY, PA)
- Benefits of continuing to use a large, shared pool of equipment
- Certain ownership structures (subsidiary, joint venture) may allow for easier state funding

## California

- 22 Charger order
  - 6 delivered to date
- 49 Siemens car order
- Expected delivery begins 2020
- State also owns 92 existing railcars, splits ownership of 49 Surfliner cars with Amtrak, and uses Amtrak Superliner, Horizon, Amfleet I cars and P-42s

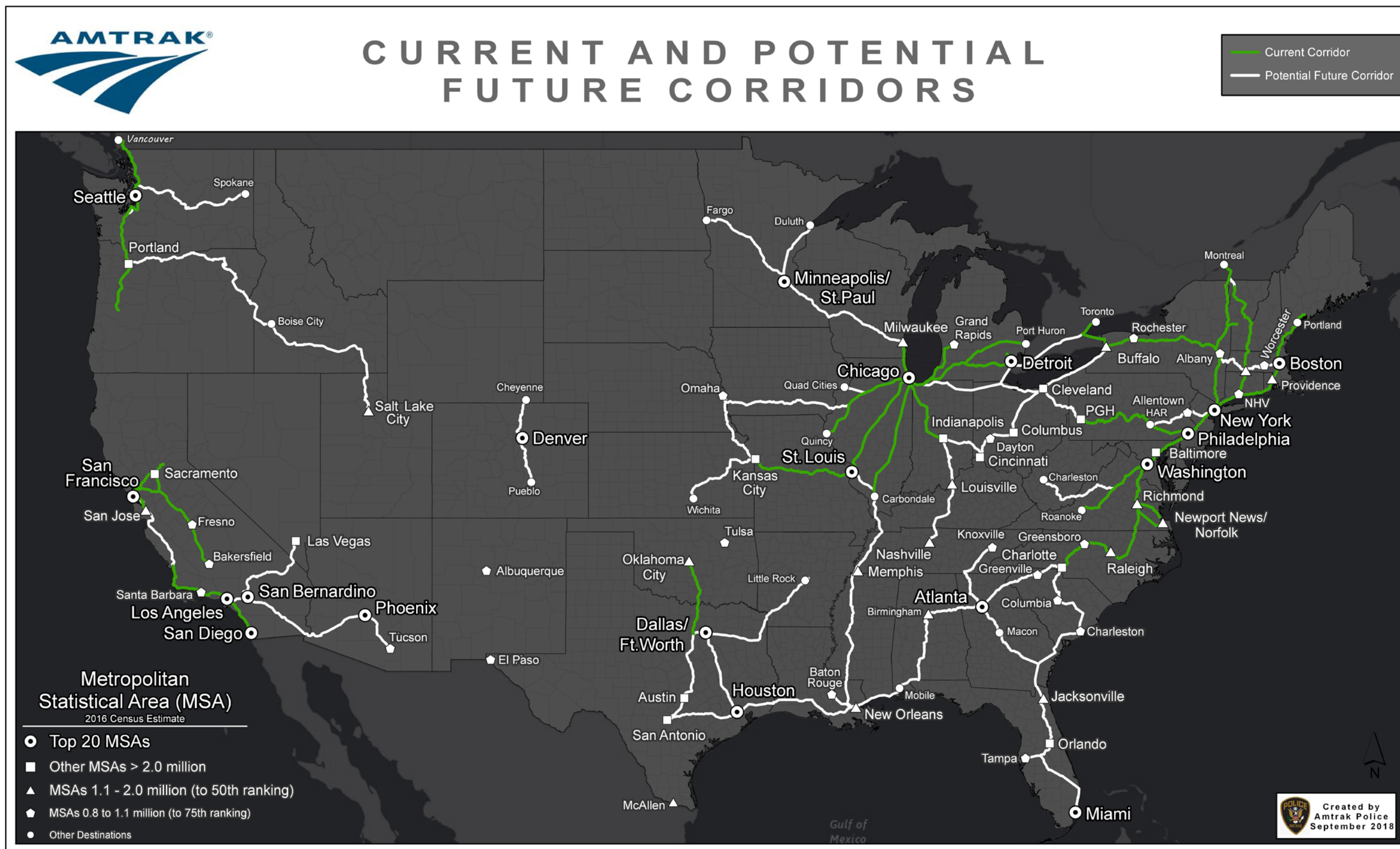
## Heartland Flyer

- Currently uses P-42, NPCU, 3 Superliner cars
- Equipment swapped on/off Texas Eagle to Chicago for maintenance

## Piedmont

- State-owned and maintained F59 locos and Heritage-style coaches

# Rail Corridors Network - 2030





# Recent Fleet Acquisition: Siemens ACS-64

- In the mid-2010s Amtrak took delivery of 70 American Cities Sprinter (ACS-64) electric locomotives from Siemens, a \$466M order
- Design is proven, off-the-shelf technology from Europe, with modifications to meet U.S. standards
- Replaced unreliable HHP-8 and aged AEM-7 locomotives on NEC
- Built in Sacramento, California



Siemens ACS-64

Photo credit: Wikimedia Commons - [Ryan Stavelly](#)

# Fleet Acquisition: Viewliner II (CAF Cars)

- Order placed in 2010 for \$298M, deliveries still underway
- Total of 130 cars for Long Distance:
  - 70 baggage cars
  - 25 dining cars
  - 25 sleeping cars
  - 10 baggage-dorm cars
- Vehicles were highly customized, with long lead times for components & manufacturing process experienced Project Management challenges
- Amtrak lessons learned: Emphasis needs to be on off-the-shelf designs; Equipment orders must have strategic focus, fleet sizing tied to network plans & new project management structure required for acquisitions



Viewliner II dining car interior

Photo: Wikimedia Commons – user [Charles Fulton](#)

# Fleet Acquisition Underway: Avelia Liberty

- 28 *Avelia Liberty* high-speed trainsets - delivery in 2021
  - Project cost at \$2.4B also includes key right-of-way improvements
  - Represents 40% increase in passenger capacity
- Trains will replace 20-year old *Acela Express* trainsets
  - Current *Acela* sets are nearing the end of a typical high-speed train service life
- Trains based on off-the-shelf technologies & designs in use throughout Europe, with assembly in New York State



Artist's rendering of the *Avelia Liberty*

Photo: Amtrak Media Center

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# Current Fleet Situation

- Most of Amtrak's current passenger car and locomotive fleets have reached, or will soon reach, the end of useful asset lifespan
  - P-42 (& P-40) GE locomotives (most of the fleet outside of the NEC) are over 20 years old and rapidly becoming unreliable, with failures in service
  - Amfleet I equipment (used on State Corridors and on NEC) has surpassed 40 years of age
  - Superliner fleet (sole Amtrak passenger equipment in 15 states) is mostly made up of first-generation multi-level cars which are over 35 years of age
- As so many fleet types are reaching retirement age, a strategic & systematic approach to Amtrak fleet replacement is being undertaken

# Priorities: Diesel Locomotive Replacement

- Replace current fleet of 20+ year old 200 P-42/P-40 diesel locomotives, used on Long Distance and State Supported routes
  - Base order of 75 units with options for up to 175 units; Final order size depends on findings of potential self-propelled equipment acquisition (see next section).
  - Seeking proposals for a dual mode / dual power (electric / diesel) version
  - Also considering a re-build option
  - Some units replaced by state-owned Charger locomotive (deliveries underway)
- Current status:
  - Request for Proposal (RFP) released 6/1/18,
  - **Proposals received 8/23/18**



P-42 diesel locomotive  
*Amtrak Photo Archives*



# Priorities: Diesel Locomotive Replacement



## Sample Diesel / Dual Power Units on the Market

Above: **Motive Power Industries HSP46 locomotive ordered by Massachusetts Bay Transportation Authority.** Photo: Wikimedia Commons, User Pi.1415926535

Above right: **Siemens SC-44 Charger locomotive, owned by an Amtrak state partner. The Charger is one example of the current generation of locomotives available in the vendor marketplace.** Photo: Amtrak Archives

Right: **Bombardier ALP-45DP Dual Power locomotive, example of a catenary-diesel dual mode unit in the current marketplace.** Photo: Wikimedia Commons, public domain





# Priorities: Single-level Passenger Vehicle - Amfleet I Replacement

- Replace 475 Amfleet I railcars
  - Cars built between the late 1960s and mid-1970s
  - Used on *Northeast Regional*, all Northeast and some Midwest state-supported routes
- Options available for replacing Amfleet I cars, include:
  - Single railcars and cab control coaches
  - Integrated trainsets
  - Multiple Unit (MU) self-propelled cars
- Request for Information (RFI) released 6/18 - solicit vendor feedback on railcars, trainsets and MUs
  - Amtrak to develop & pursue the optimal mix of replacement equipment,



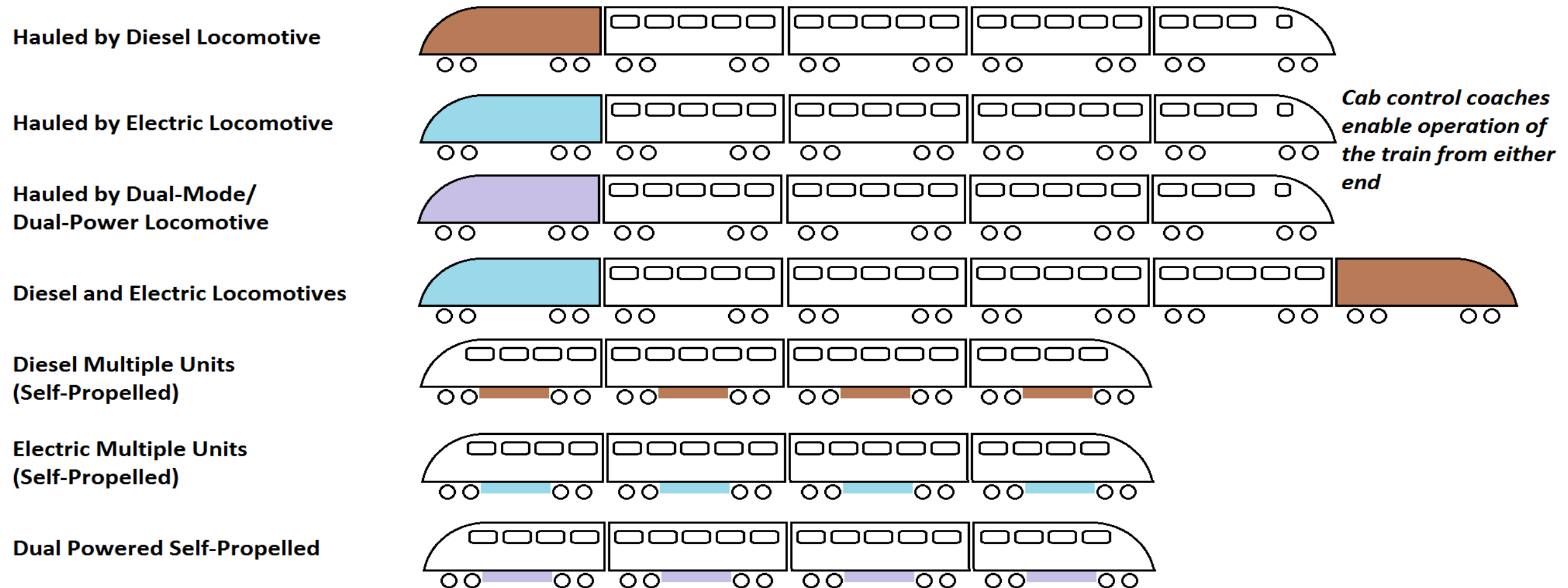
Forty year-old Amfleet I railcar nearing the end of its useful life  
Photo: Amtrak Archives

# Priorities: Amfleet I Replacement

Several ways to replace Amfleet I railcars, some of which may have implications on the number of diesel locomotives required

## Potential Integrated Trainset Configurations for a Train with Four Passenger Cars

Can use **diesel**, **electric** or **dual-powered** propulsion





# Priorities: Amfleet I Replacement

- Amtrak is studying the potential to replace locomotives and passenger cars with self-propelled Diesel Multiple Units (DMUs) on some routes
  - DMUs better tailor horsepower and capital cost to length of train for short consists, such as those used on several state-supported routes
  - DMUs are common in other countries, and have been re-established in the U.S. through several commuter rail projects



Above and right: Exterior and interior of a 3-car Union Pearson (UP) Express DMU train operating between Toronto's Pearson Airport and downtown. Photo credit: Amtrak staff



# Primer on Diesel Multiple Units (DMUs)



## DMU is a:

- Multiple-unit train powered by on-board diesel engine
- Requires no separate locomotive, as the motive power is incorporated into one or more of the cars

- Self-propelled railcars not new to the industry; RDC vehicles made by the Budd Company in operation in the 1950's to 1970's – with five classes
  - Some still in service – Denton County, TX until new Stadler GTW DMUs in service; Also VIA (Canada) operates such vehicles on a route in Ontario

## How they typically work:

- Diesel engine drives an electrical generator/alternator which produces energy. Generated current is then fed to electric traction motors on bogies in the same way as a conventional diesel-electric Locomotive

# Primer on Diesel Multiple Units (DMUs)



Wikipedia/Sonoma-Rich

Nippon-Sharyo DMU, Sonoma-Marín Area Rail Transit (SMART)



Wikipedia/Peter Skluce

Intercity seating configuration on a British Class 168 DMU

- Self-propelled railcars for shorter trains on non-electrified corridors. Eliminates the need for a separate locomotive while matching horsepower to train length
  - In many cases, a P-42 is more power than a corridor train requires
  - Like coaches, can be configured for intercity or commuter applications
  - Typically less expensive than locomotive and coaches



Stadler "Flirt" DMU, ordered for future Arrow commuter service, San Bernardino



# Priorities: Amfleet I Replacement

- Amtrak is also considering Integrated Trainsets to replace Amfleet Is
  - In past 25 years, the integrated trainset has emerged as global standard for mainline intercity rail passenger equipment
  - Cars are semi-permanently coupled; the entire train maintained as a single entity
  - Can be locomotive-hauled (*Amtrak Cascades*), integrated power cars (*Acela Express*), using diesel, electric or dual-power.
  - Unpowered trainsets can be hauled by new or existing locomotives
  - Can contain a cab control coach on one or both ends
  - Can be maintained as a package by Amtrak or OEM/manufacturer



Left: FLIRT Stadler Diesel integrated trainset



Right: British Class 800 Hitachi Azuma Dual-Power (Electric / Diesel) integrated trainset.



# Priorities: Timeline

- **Diesel Locomotive Replacement (and/or Rebuild)**
  - RFP released June 1st, vendor submissions on August 23<sup>rd</sup>, 2018
  - Evaluation period and determination of award completed by December 2018
  - Goal is to award contract, with NTP by February 2019 (aggressive schedule)
- **Amfleet I Replacement**
  - RFI release: end of June 2018
  - Vendor submissions due October 11, 2018
  - Information evaluation process completed by November 2018
  - Resultant RFP(s) anticipated winter 2018-2019
  - Goal is to award contract(s) by fall 2019
- Delivery schedules following contract award are TBD, but will be included as part of the contract

# Key Stakeholders – Engagement, Input and Partnering

- **U.S. Congress**
  - Authorization and Funding
- **Federal Railroad Administration (FRA)**
  - Regulatory certification of equipment and technical safety input
- **Amtrak's State Partners**
  - **State-Amtrak Intercity Passenger Rail Committee (SAIPRC) - Strategic partners on key fleet decisions**
- **Customers / Passenger Advocacy Groups**
  - Railcar accessibility
  - Amenity focus

# States Role in Fleet Modernization

- **What are state requirements for equipment?**
- **Service Goals:** To run at the desired service levels, how many units are needed for current base and future needs
- **State preference** on ownership, leasing or separate stream
- Some fleets may enable new service efficiencies not possible today
  - For Example: use Cab control coaches with DMUs or integrated trainsets on routes which require “wyeing” equipment today will reduce turnaround time
  - Generational advancements in equipment can reduce frequency of toilet dumps
  - Such reductions in turnaround time may allow current levels of service to be run with fewer trainsets? Or a like number of sets to provide service growth?
- **Funding**



# Next Steps

- Amtrak-State meetings to establish wants and needs
  - Features/ amenities on new equipment
  - Dual-mode (DM) power for Northeast Corridor trains
  - Ownership or financing structures to facilitate state share of funding
- We envision this to be an iterative process – as we all become more informed on equipment options, our wants and needs will likely evolve – the RFI process that Amtrak has initiated allows this to happen cooperatively