Issues in Real-world Effectiveness of AESS & Other Idle Reduction Technologies

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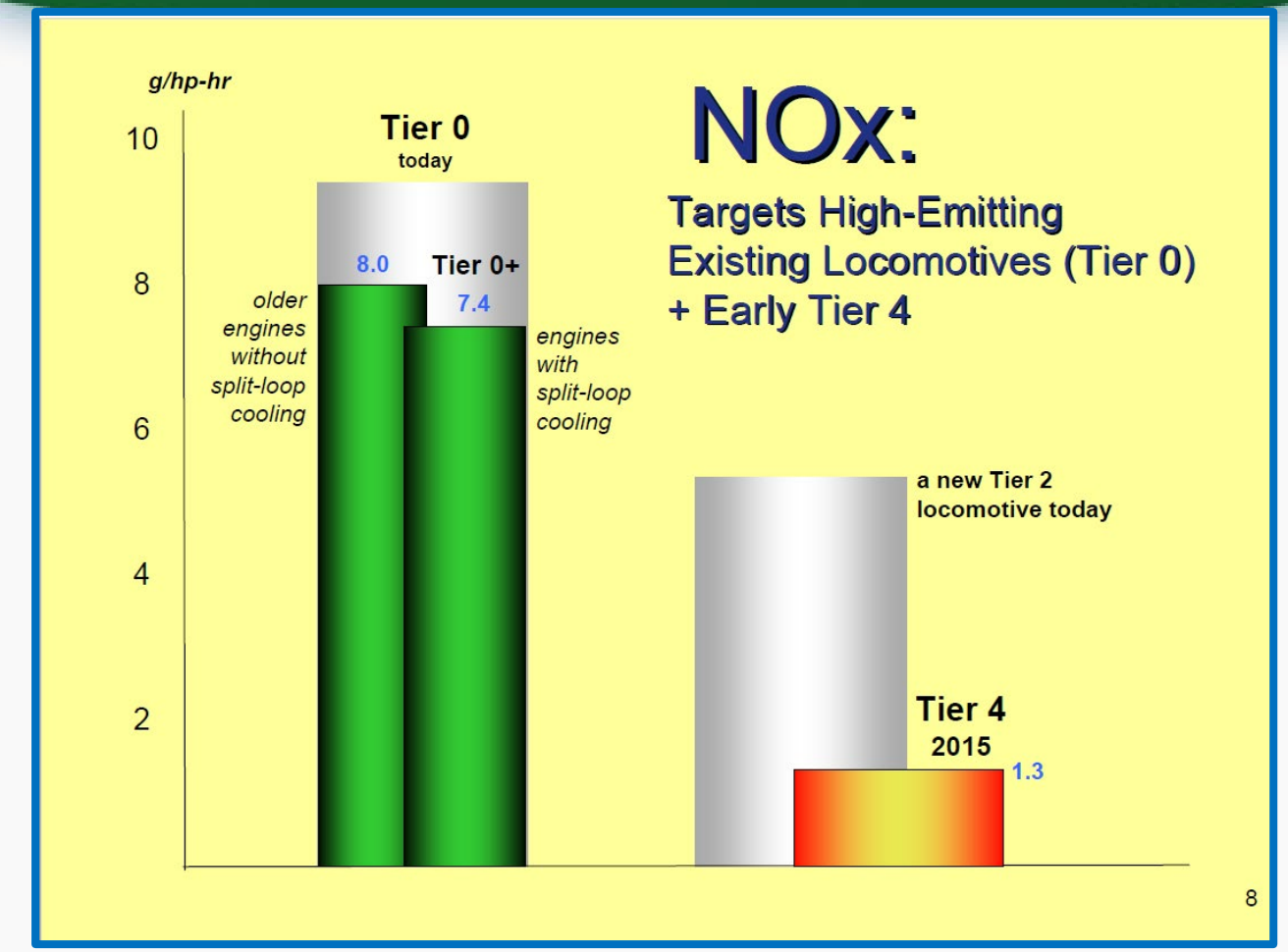
2023 FRA Workshop on Decarbonization of Rail Transportation

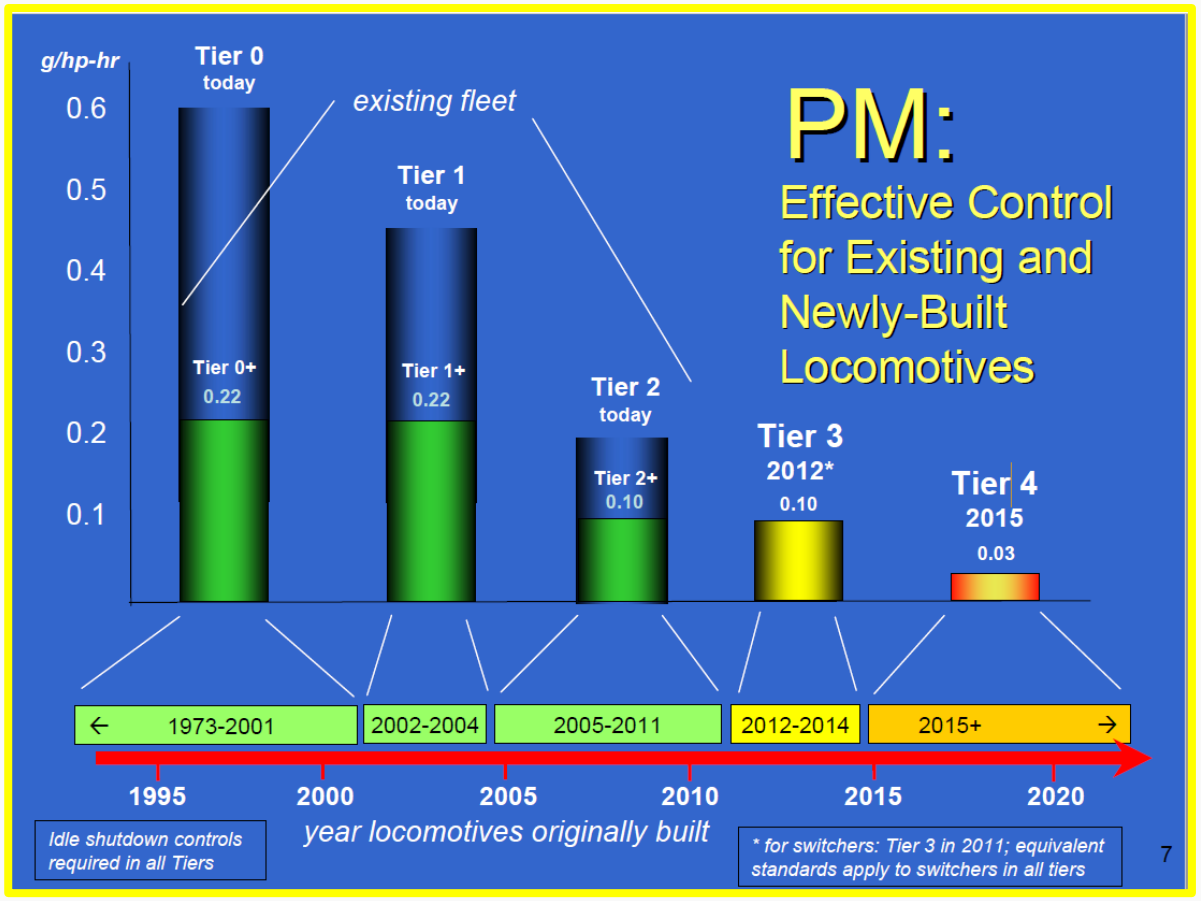
Context: EPA Regulatory & Voluntary Programs

- Locomotive Engine Rule
- Diesel Fuel Standards
- Clean Diesel Program
  - SmartWay
  - Ports Initiative
  - DERA
- Regional Implementation

SmartWay®
U.S. Environmental Protection Agency



Note: ”today” = 2008



Why try to minimize idling?

- Uphold the law
- Protect public health
- Attain ambient air quality standards
- Address hotspots
- Improve quality of life (noise, odors)
- Reduce GHGs

Tables from 2020 National Emissions Inventory, Locomotive Methodology

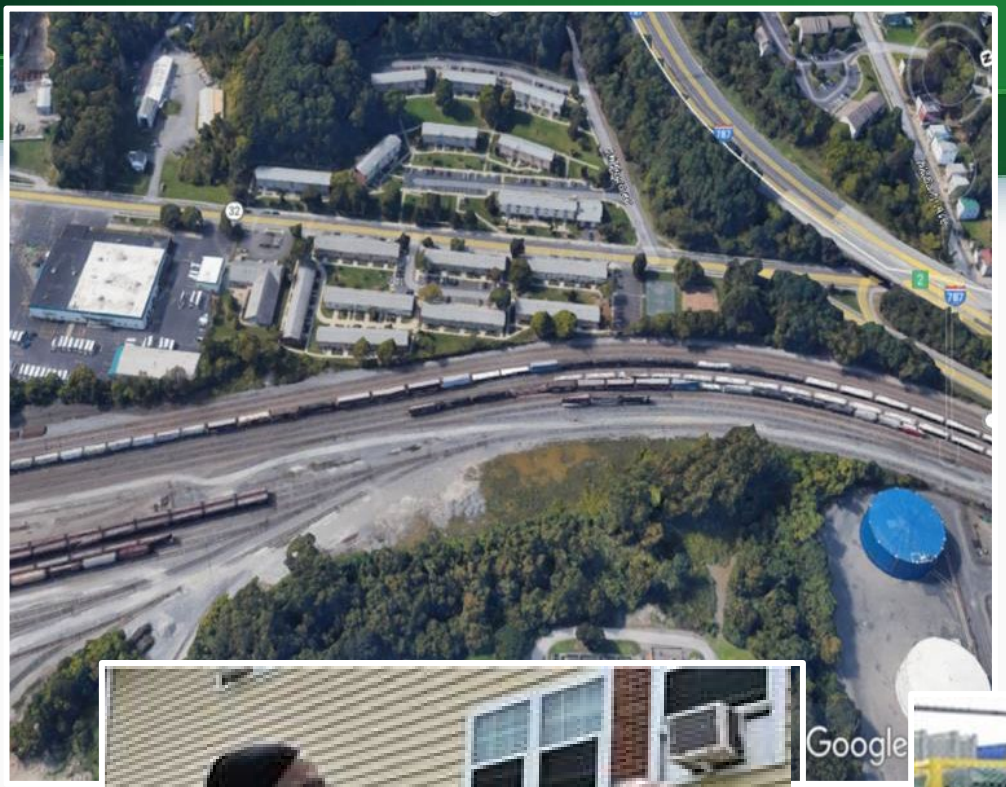
Table 21. 2017-2020 Yard Engine Fleet Composition Comparison

Tier	2020 Locomotive Count	2017 % of Fleet	2020 % of Fleet
0	673	23.61%	23.75%
0+	1,182	25.99%	41.71%
1	0	0.00%	0.00%
1+	26	4.76%	0.92%
2	7	2.33%	0.25%
2+	0	4.64%	0.00%
3	11	10.18%	0.39%
4	23	2.47%	0.81%
NC	912	26.01%	32.18%

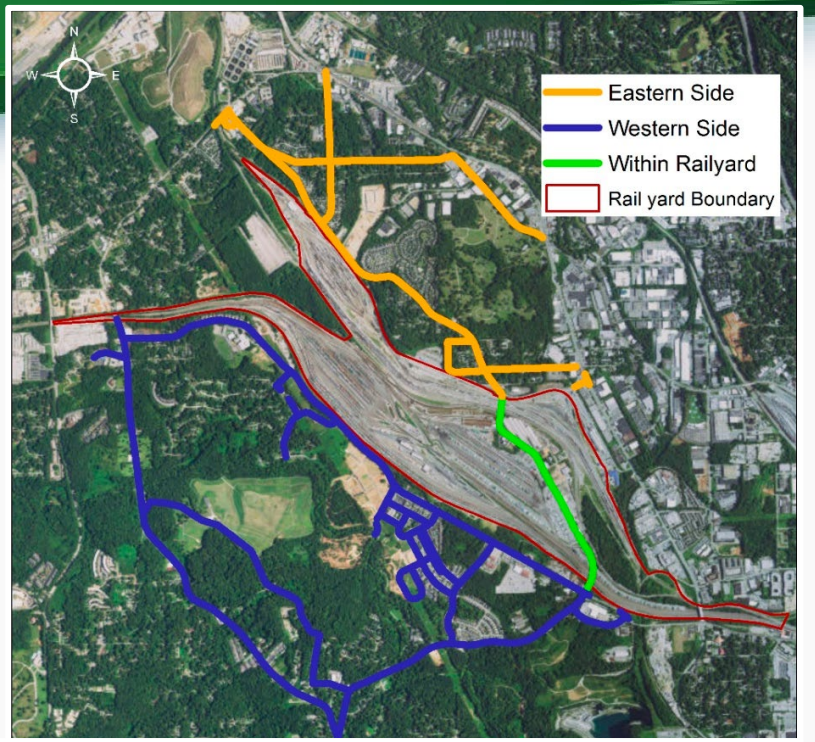
Table 19. 2017-2020 Class II/III Fleet Profile Comparison

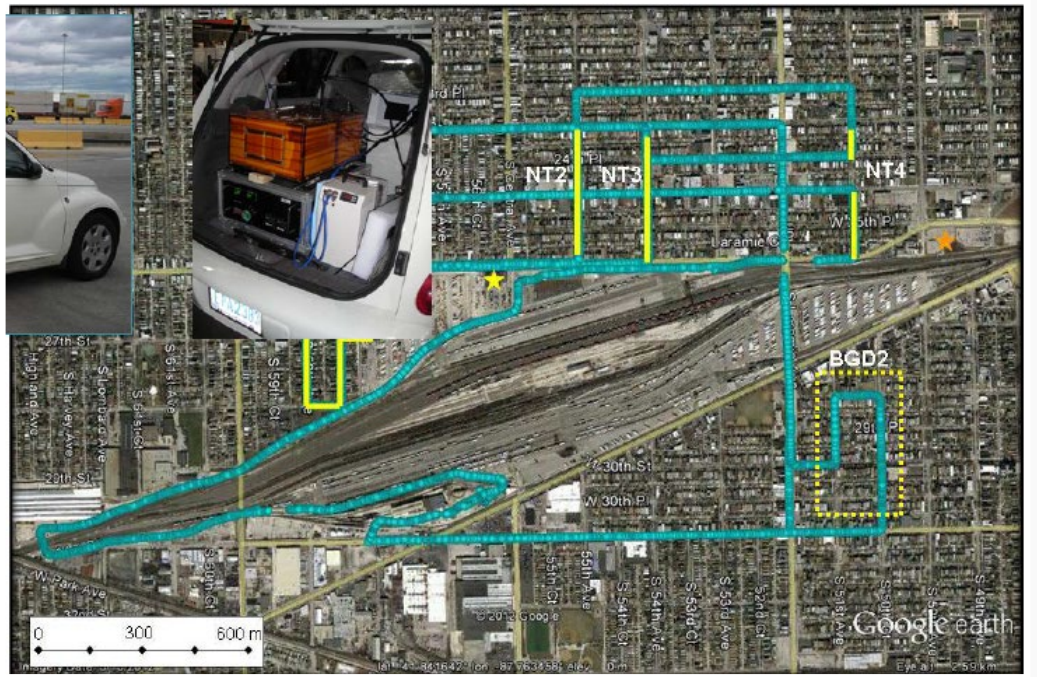
Class II/III Fleet Profiles				
Tier	2017 Locomotive Count	2020 Locomotive Count	2017 % of Fleet	2020 % of Fleet
0	1,379	1,664	44%	48%
1	7	31	0%	1%
2	107	169	3%	5%
3	118	160	4%	5%
4	22	64	1%	2%
NC	1,492	1,359	48%	39%
Total	3,125	3,447	100%	100%

METRIC		**SWITCH** (defined by duty cycle & low HP) (CA: 1,500-2,000 HP)	**LINE HAUL** (defined by duty cycle & high HP)	LINE HAUL DOING SWITCH (defined by duty cycle only) (CA: 3,000-4,000 HP)
On-Duty Time (hr/yr)	CA	3,000	5,000	3,000 (inferred)
	EPA	4,450	4,350	4,450 (inferred)
Total Idling Time (hr/yr)	CA	1,800 (60% of on-duty time)	2,000 (40% of on-duty time)	1,800 (inferred)
	EPA	2,660 (60% of on-duty time)	1,650 (40% of on-duty time)	2,660 (inferred)
Discretionary Idling Time (hr/yr) (EPA: “low idle” time)	CA	900 (50% of total idling time)	?	900 (50% of total idling time)
	EPA	1,330 (50% of total idling time)	825 (50% of total idling time)	
Reduction (%) in Total Idling Time & Fuel Consumption due to AESS	CA	10-11	3	10-11
	EPA	50	50	50
CA = California Air Resources Board Estimates, ca. 2015; some info based on GE, EMD & Chicago studies. EPA = Regulatory Impact Analysis, 2008 Locomotive Rule. THIS IS NOT AN OFFICIAL EPA PRODUCT.				



AIR SENSOR TOOLBOX





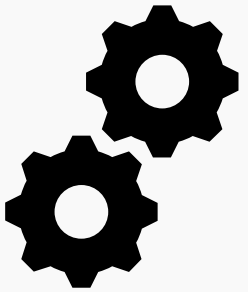
WHY *DO* LOCOMOTIVES IDLE?

Mechanical

- Equipment issues
  - breakdowns (locomotives, cars)
  - weak batteries
  - worn starters
  - leaky brake lines*
  - worn compressors
- Safety/maintenance issues
  - avoid doing FRA tests
  - maintain brake pressure readiness to avoid pre-trip failure

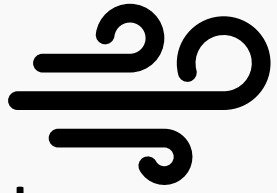
- Lack of idle reduction technology (AESS, APU, shore power, yard air)
  - incompatible with engine (age, type) or facility layout
  - not installed
  - insufficient to address locomotive / crew needs
  - Malfunctioning

* worse on a long train



Meteorological

- freezing temps
- windy/wet/cold weather effects on exposed parts (some models)
- excessively hot temps
- delicate cab electronics need tighter temp control
- stranding due to snow or heat-warped rails



Spatial

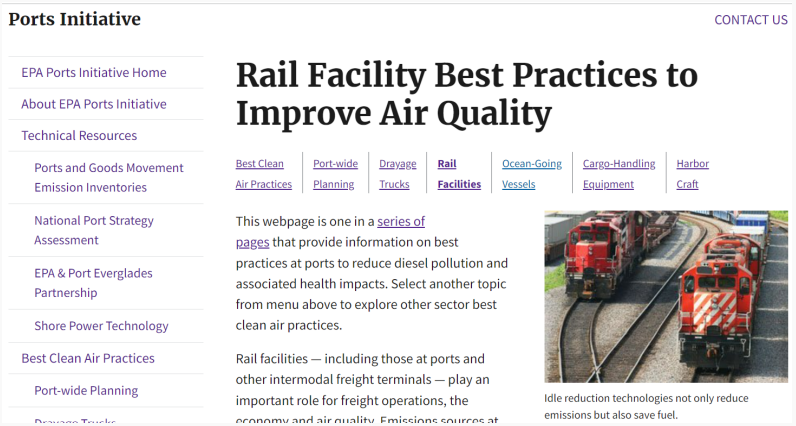
- configuration
- capacity
- order
- road crossings & shared track
- construction-related delays

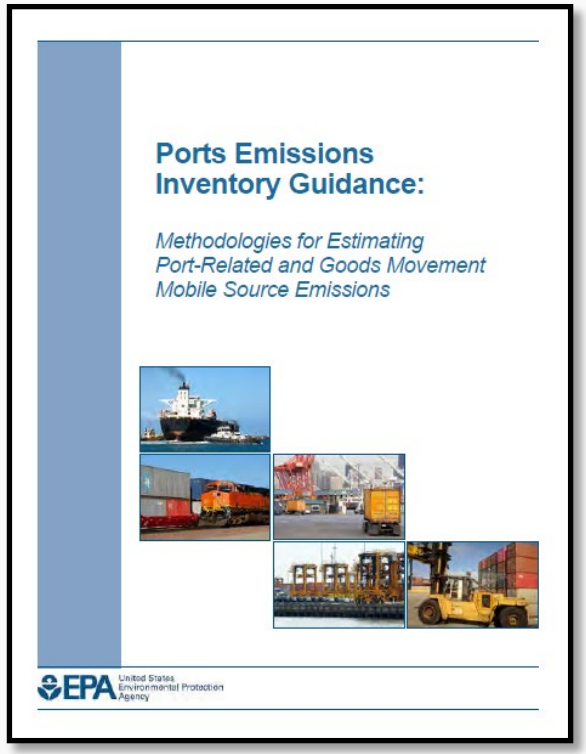
Operational

- Operator issues
  - yard or crew not adhering to operating plans or service bulletins
  - plans and bulletins outdated, confusing, too conservative, tardy, etc
  - crew comfort in hot or cold weather
  - crew don't understand loco or idle equipment operation (especially when power sharing?)
  - crew don't understand protocols
  - crew noncompliant (crew change or layover location, shutdown protocol, etc)
- Train scheduling
  - line congestion and tight schedule windows (freight, passenger)
  - cascading delays
  - premature arrival, delayed departure
  - fire or police officials order a train held short of destination
- Crew scheduling
  - hours of service expire
  - not enough operators
  - staffing practices (e.g., avoid paying overtime)

How EPA has tried to reduce idling

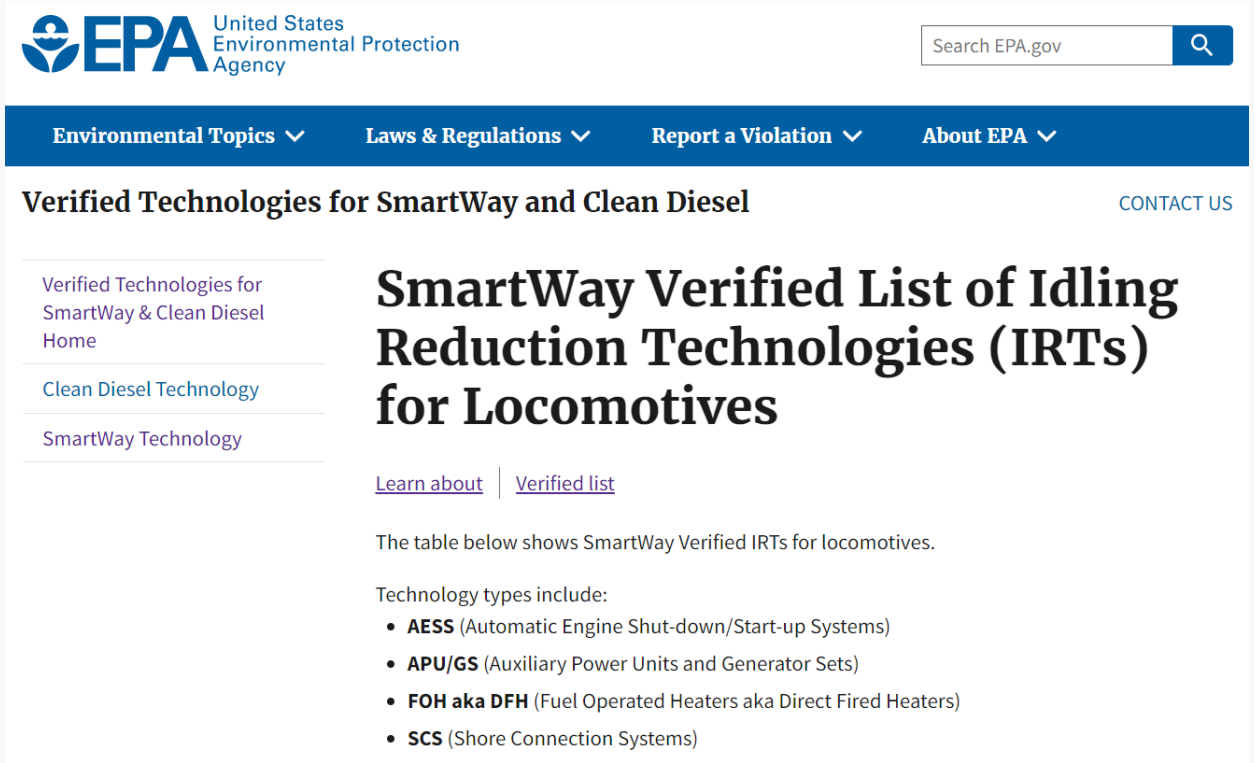
- Loco Engine Rule: outreach and enforcement
- DERA awards
- Ports Initiative: rail BMPs, inventory & strategies
- Field work





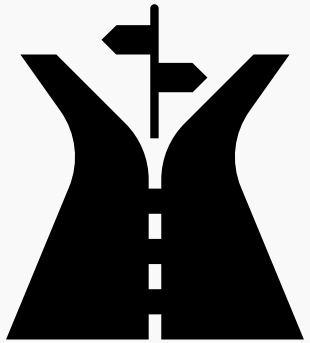
The Limits and Promise of AESS

- Limits
  - Inherent
  - As applied
- Promise
  - 2nd generation
  - Optional add-ons
  - Combination with other IR: DWS, SCS, APU



Where do we go from here?

- Allow more state control over discretionary idling?
- Work more closely with STB on environmental impact statement review?
- Better characterize railyard equipment, activity and emissions to estimate impacts?
- Help RRs achieve sustainability goals in a way that matters locally, through…
  - Staffing facilities adequately and managing personnel
  - Maintaining & upgrading equipment
  - Improving yard configuration and management
  - Self-monitoring & planning
  - Communicating with communities
- *Your ideas welcome!* *otaq@epa.gov*



Thank You

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