RSAC

ECP Train Braking Modernization Task Group

ECP Task Group Charter

Background common to Braking Modernization Task Groups:

On May 8, 2015, the Pipeline and Hazardous Materials Safety Administration (PHMSA) published a final rule (HM-251) which, among other items, defined "high hazard flammable train" (HHFT) and a "high-hazard flammable unit train" (HHFUT) HM-251 also required HHFUTs transporting at least one flammable liquid classified as a Packing Group (PG) I material be operated with an ECP braking system by January 1, 2021, and all other HHFUTs be operated with an ECP braking system by May 1, 2023. 80 FR 26644. On September 25, 2018, PHMSA repealed the HM-251 final rule based on the mandate of Section 7311of the FAST Act (requiring a determination of whether the rule's brake requirements were justified based on whether the final RIA demonstrated that the benefits exceeded the costs. 83 FR 48393. On February 21, 2023, the Secretary of Transportation announced that the Department would pursue further rulemaking on HHFTs and ECP brakes.

ECP Task Group Charter

Opportunity Statement:

Identify potential methods of modernizing train brake equipment and brake-related processes and procedures to improve train braking effectiveness, including consideration of the use of electronically controlled pneumatic (ECP) brake systems.

Description:

The Task Group (TG) will evaluate the feasibility of requiring ECP brake implementation on HHFTs and other trains transporting large quantities of hazardous materials, trains of a certain length, and trains using any number of DP units.

Group Objectives

1. Determine any changes to ECP brake technology or challenges to its implementation and identify any potential improvements since PHMSA repealed the HM-251final rule.
   a. Identify changes
   b. Determine challenges
2. Determine the logistical and financial feasibility of ECP brake technology implementation on HHFTs and other trains transporting large quantities of hazardous materials, trains of a certain length, and trains using any number of DP units.
   a. Define cases
   b. How do we address challenges
   c. Update financial findings from 2018 rule to 2024.

TG Team Members:

Steve Zuiderveen – FRA MP&E
Nataka Neely – FRA
John Peternel – FRA
Hodan Wells – FRA
Jason Schlosberg – FRA
Brenda Moscoso – AAR
Mike Rush – AAR
Ron Hynes – AAR
Aaron Ratledge – BNSF (AAR)
Beau Price – BNSF (AAR)
Abe Aronian – TSB
Robert LeBlanc – TSB
Kim Wachs – TSB
Grady Cothen – FRA (retired)
Alan Zubor – AECOM (retired)
John LaDuc – NYAB
Michael Parisian – NYAB
Dan Rice – Wabtec
Benjamin Henniges – Wabtec
Adam Eby – Amtrak
Jeff Moller – AAR
Michael Navarro – CSX (AAR)
Mike Wiley – CSX (AAR)
Jamie Wiliams– NS (AAR)
Timothy Adkins – NS (AAR)
Shane Hubbard – BLET
Christy Smith – BLET
Vince Verna – BLET
Carl Lakin – BRC
Jo Strang – ASLRRA
JR Gelnar – ASLRRA
Roger Dalske – AITX
Lee Verhey – RSI
Anand Prabhakaran – Sharma & Associates

Subtask 1

ECP Brake Improvements Since 2018

ECP Brake Improvements To 2018 – Review of ECP Benefits (Subtask 1)

Train Handling:

- Reduced stopping distances, lower in-train forces, automatic and manual (from display) cut-out of individual car braking capabilities, graduated release functionality, fixed brake rate, constant charge of brake pipe, and brake cylinder maintaining

Cycle Time Reduction:

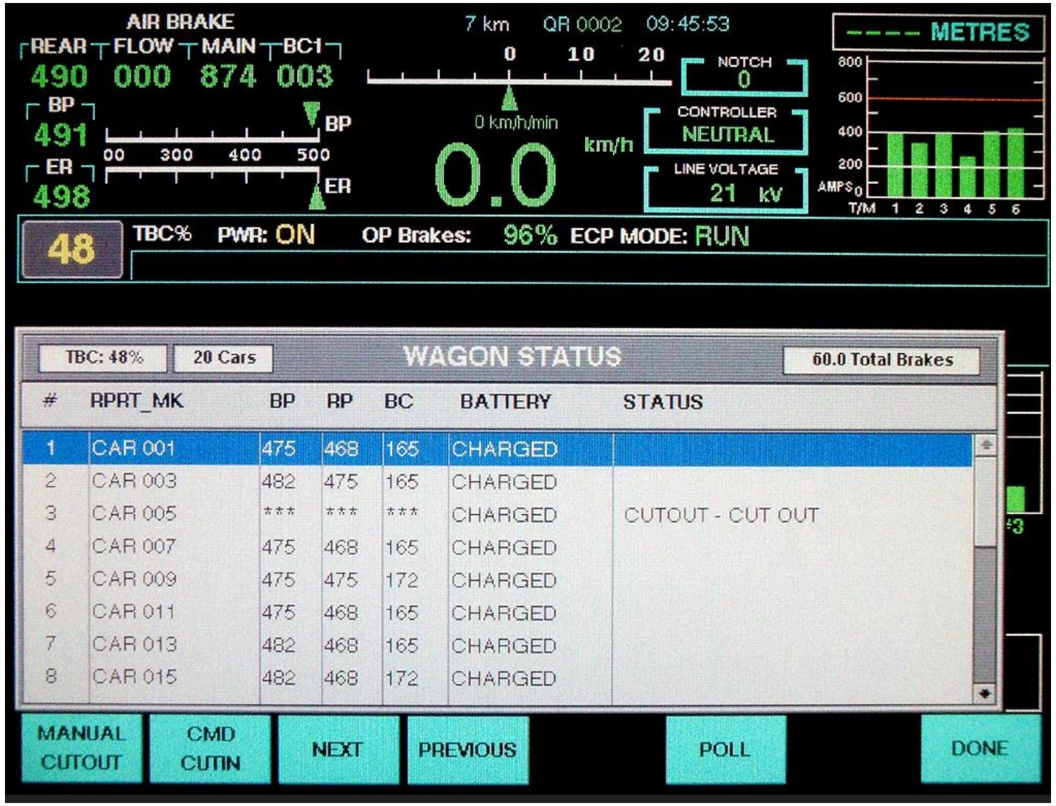
- Increased average train speed and brakes can be used during train loadout and dumping

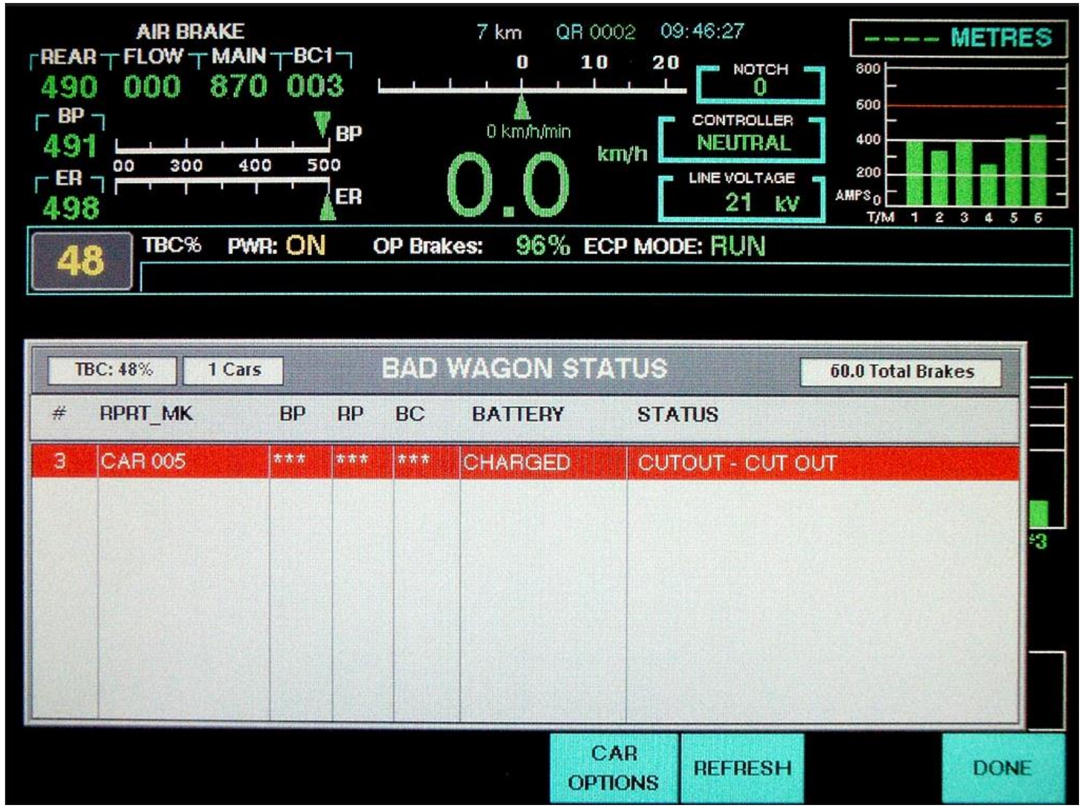
Increased Operator Feedback and Diagnostic Information:

- Train manifest with vehicle position & health status, train length & weight, train integrity (real time % operative brake)
- If there's a critical issue, the train will automatically apply brakes without operator intervention

ECP Brake Improvements To 2018 – Review of ECP Benefits (Subtask 1)

- Monitor brake system response from each car in real time. Operator knows of braking issues and has the ability to take action to non-critical issues. Example below:





Improved Troubleshooting & Diagnostics:

- Real time train health status display, train level fault summary screens, improved train & vehicle troubleshooting, and stuck brake notifications

ECP Brake Improvements Since 2018 – Review of ECP Improvements (Subtask 1)

Train Roll Away Protection

Improved Trainline Communication Reliability:

- Increased communication loss timing threshold, improved trainline accessories (locomotive/car), improved trainline power filtering & isolation, and improvements/advancements in intercar cable design

Optimized ECP Train Initialization (Improved ECP Set-up Time)

Next Generation Battery Technology:

- Enhanced life and optimized device power consumption

Onboard Power Capabilities (power on each vehicle):

- Allows for addition of car sensors. Sensors in use today: handbrake status, empty/load, hatch/door status

ECP Brake Improvements Since 2018 – Open Actions (Subtask 1)

Gather supporting data for ECP benefits

- Provide detailed information related to specific challenges that ECP helps improve

Gather supporting data for ECP improvements since 2018

- Provide ECP reliability data from current ECP operators. Include details related to operating environment and train type (unit/mixed freight)

Work with economists on updating financials

Subtasks 2 -3

Group 2 - Challenges to ECP Implementation
Group 3 - Logistical feasibility of ECP on HHFT

Group 2 Challenges to ECP Implementation

Team overview of challenges:

- ECP major components
  - Trainline Power Supply (TPS) provides power to ECP trainline to charge batteries
  - Trainline Communication Controller (TCC) sends and receives commands from ECP equipped cars
  - Car Control Device (CCD) ECP brake valve at each car to send diagnostic messages and receive brake commands
- ECP Operation
  - Reviewed **emulation**, **stand-alone**, & **overlay** modes of operation
    - **Emulation** does not provide ECP benefit when not receiving signals from ECP locomotive
      - Must have intact electric trainline to support brake application
      - Freight cars need to have electric trainline to charge batteries
      - Team consensus – Emulation is not practical in freight service.
    - **Stand-alone** not viable solution for industry implementation
      - Hurdles and challenges to rail operations is high due to competing modes of operation
      - Stand alone ECP cannot operate in a conventional train
      - Equipment failures lead to major network disruptions
      - Team consensus – Stand-alone ECP is not a practical path for critical mass expansion

Group 2 Challenges to ECP Implementation

Team overview of challenges:

- ECP Operation (cont'd)
  - **Overlay** ECP provides more flexibility
    - Benefits
      - Dual mode of operation – conventional or ECP
      - Allows for operating flexibility and expansion
      - Would be less disruption to the North American Rail Network
    - Hurdles
      - ECP equipment degradation (i.e., batteries, connectors) waiting on critical mass to operate ECP
      - Equipment retro-fit or new-builds would likely need refurbished prior to operation
      - Two types of operating systems (ECP and Conventional) inflates cost and support
        - Material carrying costs and storage capability across a broad network
    - Maintenance processes
      - Higher maintenance
      - SCABT – two types to perform when on repair track
      - New equipment needed to perform tests and inspections
      - Training for ECP equipment is much different than conventional air brakes

Group 2 Challenges to ECP Implementation

Team overview of challenges:

- Regulatory concerns
  - Conventional trains require a Class 1 Brake Test prior to departing initial terminal
  - ECP trains require a Class 1 Brake Test every 3500 miles (vs. 1000 or 1500 conventional)
  - Overlay systems can operate conventional or ECP, over the road failures would require immediate brake test of the alternate system unless redundant testing is performed at initial terminal
  - Required tests and inspections for maintenance and train operation
- Interchange with short lines, utilities, other US carriers, and cross-border railroads
  - There is a need for flexibility across networks and international borders to limit disruptions
  - Rules governing use of alternative braking system
  - Foreign carriers/utilities having the means to operate equipment
  - Vandalism / theft
- Testing of ECP equipment in train yard
  - Class 1 test cannot be performed with conventional yard test equipment
  - ECP outbound brake test requires an ECP equipped locomotive to command and control
  - Locomotive utilization will be impacted without further development of ECP brake testing tools

Group 2 Challenges to ECP Implementation

Team overview of challenges:

- ECP conversions
  - Where would the work be performed
    - Repair tracks are not feasible, program work only (16 person hours for 1 installation)
  - Remaining equipment life would be a factor
    - Freight car – 50 years
    - Locomotive – 30
    - Cars with short remaining life span would likely be removed from service due to the need for each car to have a communication path to an ECP locomotive
  - Cost
    - 10K per car estimated material and labor
    - 50k per locomotive with modern (EBV) brake systems, estimated materials and labor.
    - Estimated 30 days out-of-service for each car
    - Additional float equipment would be needed to cover out of service time
    - Lost opportunity cost
  - Timeline for conversion
    - Continuing to forecast as other information is gathered

Group 3 Challenges to ECP Implementation HHFT-HHFUT

Team overview of challenges:

- HHFT – Length required
  - Prior recommendations by proposed rule to require ECP operation
    - More that 20 HHF cars coupled
    - More than 35 HHF cars at different locations within a train
  - ECP operation cannot be leveraged without communication from an ECP lead equipped locomotive to ECP equipped cars in a mixed consist train
  - Operating HHFT as proposed would force roads to operate small ECP trains without any benefit
    - ECP trains with 20-35 cars will not have improvement in stopping distances
    - Shorter trains will lead to additional crews to operate the shorter trains
    - Locomotive fleet utilization would be strained
    - Short HHFT or HHFUT trains would fundamentally change rail operations

Identify Costs and Impacts to Small Businesses (Subtask 2)

Team overview of challenges:

- Short line Challenges
  - Training requirements for a smaller and less specialized workforce
  - Stocking repair parts for ECP would be costly
  - Unit trains are delivered to short lines, but the short lines often deliver cars to the customer in smaller pieces, requiring more coupling and uncoupling of ECP cables, and more opportunities for connection problems
  - Short line locomotives tend to be older and commonly use 26L equipment, costs of installing customized ECP would be greater than for newer locomotives
  - Many short line locomotives would be unable to be modified for ECP

Subtask 4

ECP Brake Financial Feasibility: Updating/Extending Dec 2017 Economic Analysis

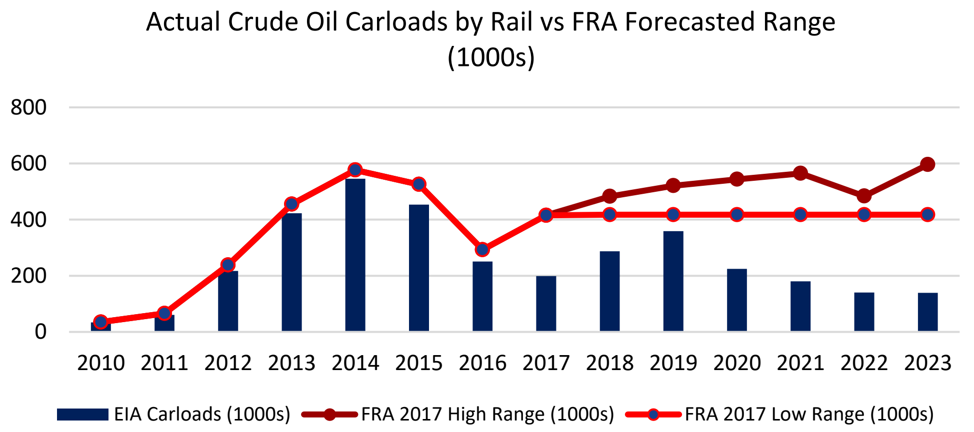
ECP Brake Financial Feasibility: Updating/Extending Dec 2017 Economic Analysis

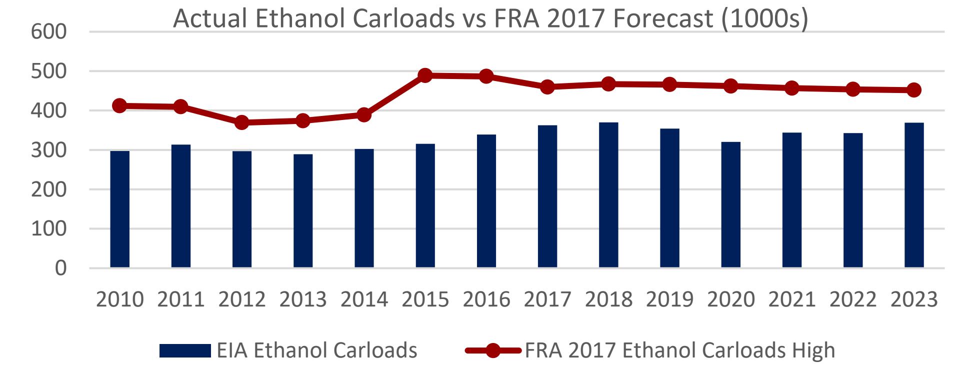
Analyzing Changing Landscape Since 2018

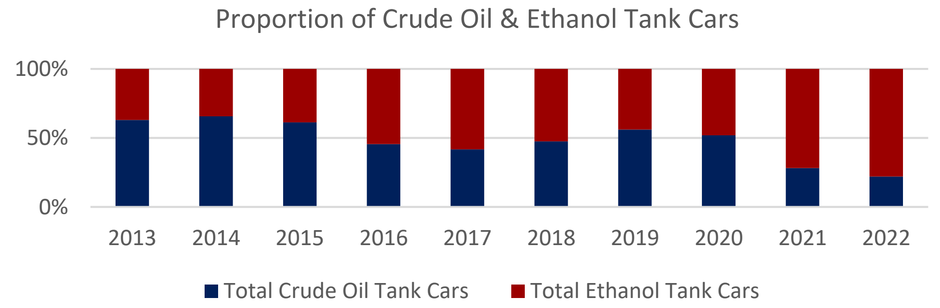
- Newly identified ECP brake advantages that may benefit subset of US operations
- Changes in crude and ethanol movements by rail ➔
- Phase-out of DOT 111s in crude oil & ethanol service
- Additional safety measures & increased use (e.g., wayside detectors, distributed power)

Challenges for Extending HHFUT to HHFT Mixed Freight

- HHFT mixed freight <u>substantially</u> increases fleet size, implementation duration and cost
- Diminishing safety benefit for HHFT mixed freight
- Additional costs for cars not carrying high hazard flammable liquids in HHFT trains
- The return on investment is much lower for HHFT compared to HHFUT







ECP Brake Financial Feasibility: Updating/Extending Dec 2017 Economic Analysis

Preliminary Analysis

- Identified costs & inputs for updating, expanding, and developing a more accurate analysis.
    - Initial and ongoing costs of implementing ECP for stand alone & overlay systems
- Need for transportation and mechanical workforce training
- New spill clean-up costs to reflect new composition of HHFUT fleet and expanded comprehensive oil spill response plan requirements

New Work Necessary to Complete Meaningful Analysis

- Costs:
    - Require methodology for escalating previously used prices to current dollars
    - Ongoing maintenance and labor for maintaining ECP
    - Ongoing asset management cost
    - Impact to service/operations with out of service time
- Benefits:
    - Quantify benefit of derailment mitigation
    - Monetize improvements in reliability and improved network velocity (freight car investment)
    - Expanded time horizon of analysis to better capture benefits
- New OMB Analytical Requirements
    - Discount rates: 1%, 2%, 3%, 7%