

ECP BRAKE IMPLEMENTATION ON NORFOLK SOUTHERN

RSAC MEETING
WASHINGTON, DC
OCTOBER 25, 2007

GERHARD THELEN
VP OPERATIONS PLANNING & SUPPORT

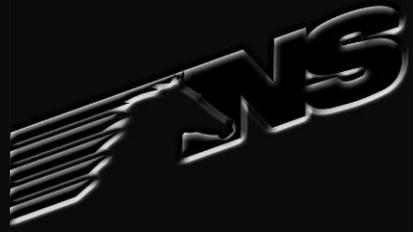
What Is ECP?



ECP = Electronically Controlled Pneumatic Braking

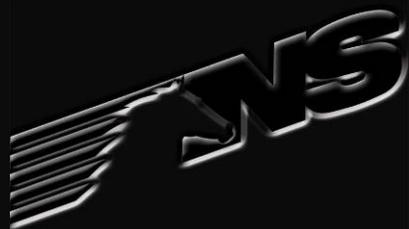
- 1) **Stand-Alone ECP-** Can only be operated in full ECP equipped trains. ABDX service portion is replaced by a CCD (Electronic Car Control Device). Stand-Alone ECP utilizes a conventional emergency portion for emergency brake applications.
- 2) **Overlay ECP-** Utilizes a conventional braking system with a service and emergency valve along with add-on ECP CCD. This equipment can serve in ECP or Conventional braking mode.

NS will operate Stand-Alone ECP.



Advantages of ECP

- Shorter Stopping Distances
- Reduced In-Train Forces
- Improved Train Handling
- Graduated Brake Application and Release
- Automatic Train Consist ID & Sequencing
- Real-Time Train Brake Status Feedback



How does ECP Function?

ECP end-of-train device

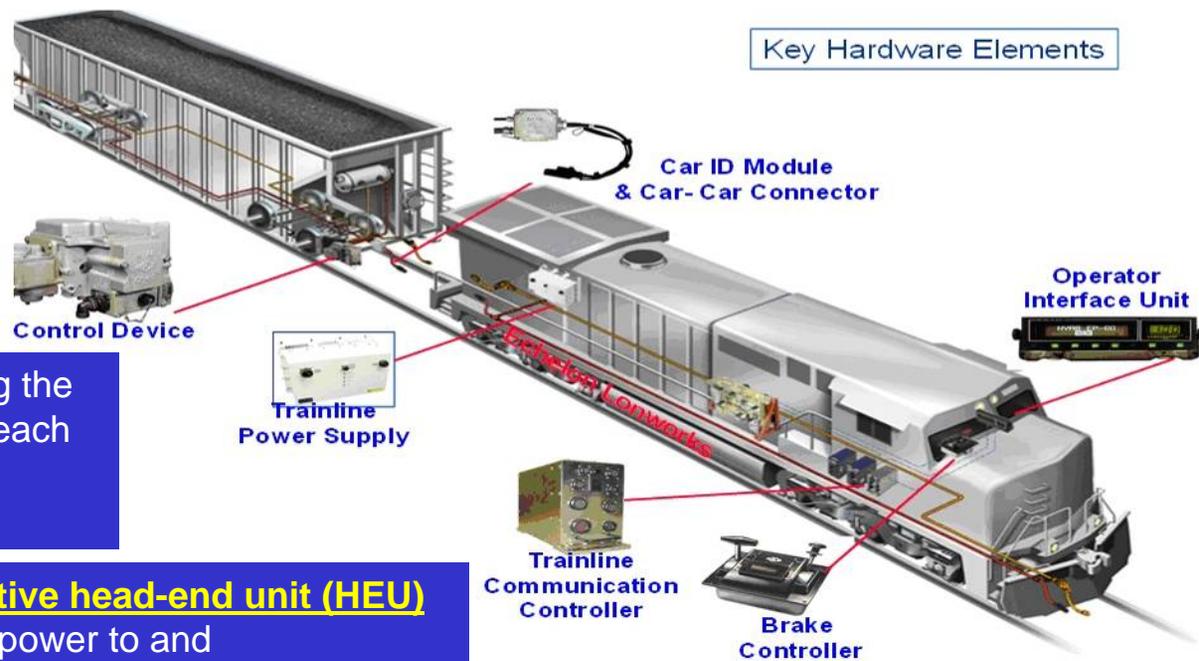
provides termination of the communication line and transmits an end-of-train message back to the HEU for establishing trainline integrity.

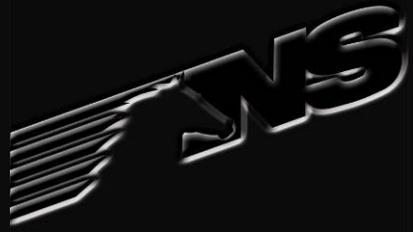
ECP trainline a cable running the length of the train, supplying each CCD with power and carrying braking and health signals.

Locomotive head-end unit (HEU)

supplies power to and communicates with each of the car control devices (CCD) to apply and release the train brakes.

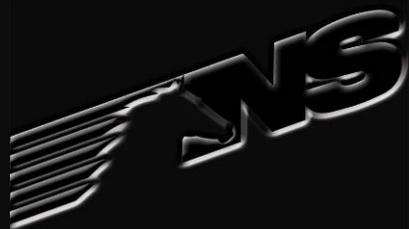
Key locomotive and freight car components of an ECP brake technology system





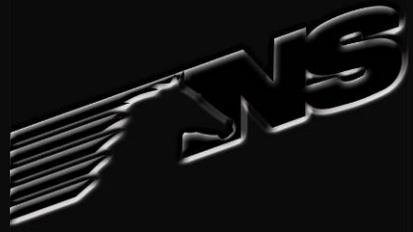
What are the Benefits?

- Instantaneous Brake Application and Release
- Fixed Brake Rate
- Graduated Brake
- Proportional Control
- Constant Charging of Brake Pipe
- Pneumatic Backup
- Trainline Power Safety Interlock
- Train Manifest and Serialization



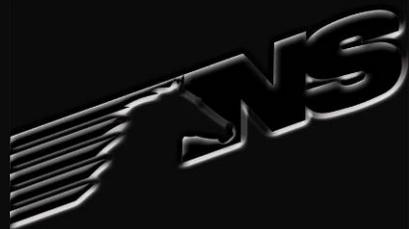
FRA Waiver Issued to NS and BNSF on March 21, 2007

- FRA has taken a position advocating railroad industry transition to ECP.
- The waiver modifies portions of Title 49 CFR 232 to fit ECP's enhanced safety technology.
- NS decided to equip and operate ECP pilot trains as part of a larger renewal of system coal equipment.
- NS will participate in initiatives to quantify ECP costs and benefits.



NS ECP Implementation Plan

- Application to new coal cars and locomotives
 - Two trainsets of gondolas being placed into service in 4th quarter 2007 to Shelocta, PA from Monongahela mine origins; 115 car trains with 3 locomotives
 - Two trainsets of automatic dump cars to be placed into service in 1st half of 2008 to Clover, VA from southwest VA mine origins; 100 car trains with 5 locomotives (distributed power operation)
- Participation in possible operation of PRB coal trains to Plant Scherer in GA
- Comprehensive ECP training plan has been developed and is being implemented with involvement of all stakeholders

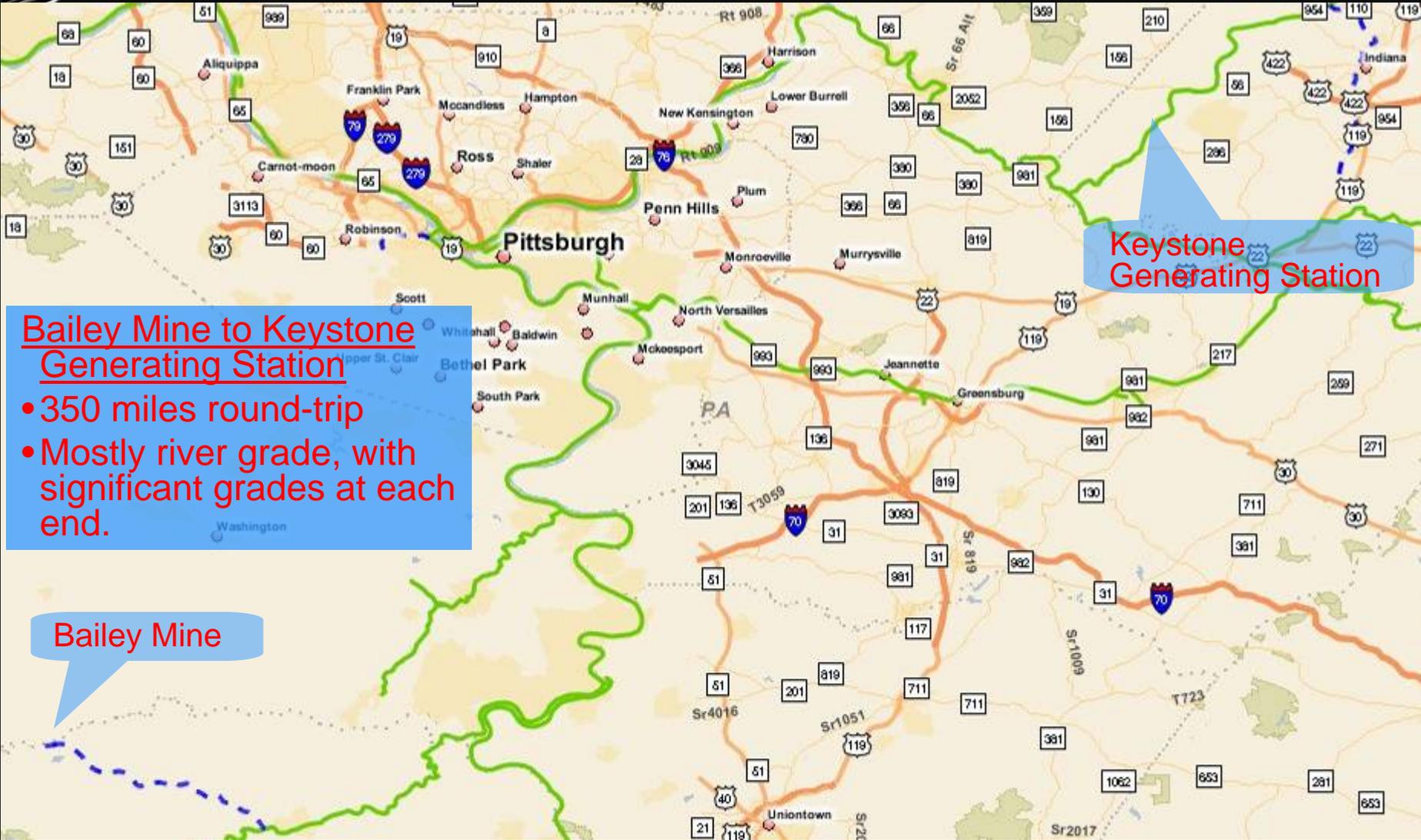


Data Collection for Economic Analysis

- Compare conventional trains with ECP trains in same service
 - Fuel savings
 - Cycle time improvement
 - Reduced wheel change-outs



Route of the Shelocta ECP Coal Trains



Bailey Mine to Keystone Generating Station

- 350 miles round-trip
- Mostly river grade, with significant grades at each end.

Bailey Mine

Keystone Generating Station

First ECP Coal Train for Shelocta Service, 10/11/07



First Service: Shelocta Unit Coal Trains

- Locomotives: 30 new GE ES40DC (6-axle, 4000 hp) with NYAB HEU's
- Cars: 240 new "hybrid Beth Gons" with stainless steel/aluminum carbodies, NS owned, with NYAB EP-60 control valves.

New Coal Train for Shelocta
loading at Bailey Mine



Hybrid Aluminum/Stainless Steel Coal Gondola

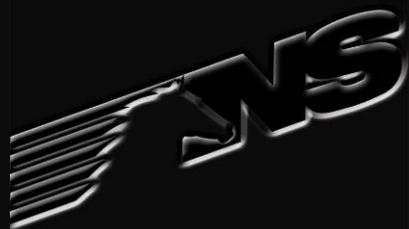
- 240 (2 sets) built with full ECP for Shelocta service
- 120 (1 set) non-ECP for Shelocta service





Second Service: Clover Unit Coal Trains

- Locomotives: 30 new GE ES40DC (6-axle, 4000 hp) with NYAB, 6 of which will be Distributed Power (DP) by wire for this service.
- Cars: 400 new Rapid Discharge aluminum hoppers manufactured by Trinity Industries with NYAB EP-60 control valves.



Route of Clover ECP Trains

Andover – Clover
via Bluefield



Andover – Clover
via Bulls Gap/Bristol

Operator Interface Unit (now integrated into operator's screens)



Locomotive Junction Box and Head End Termination



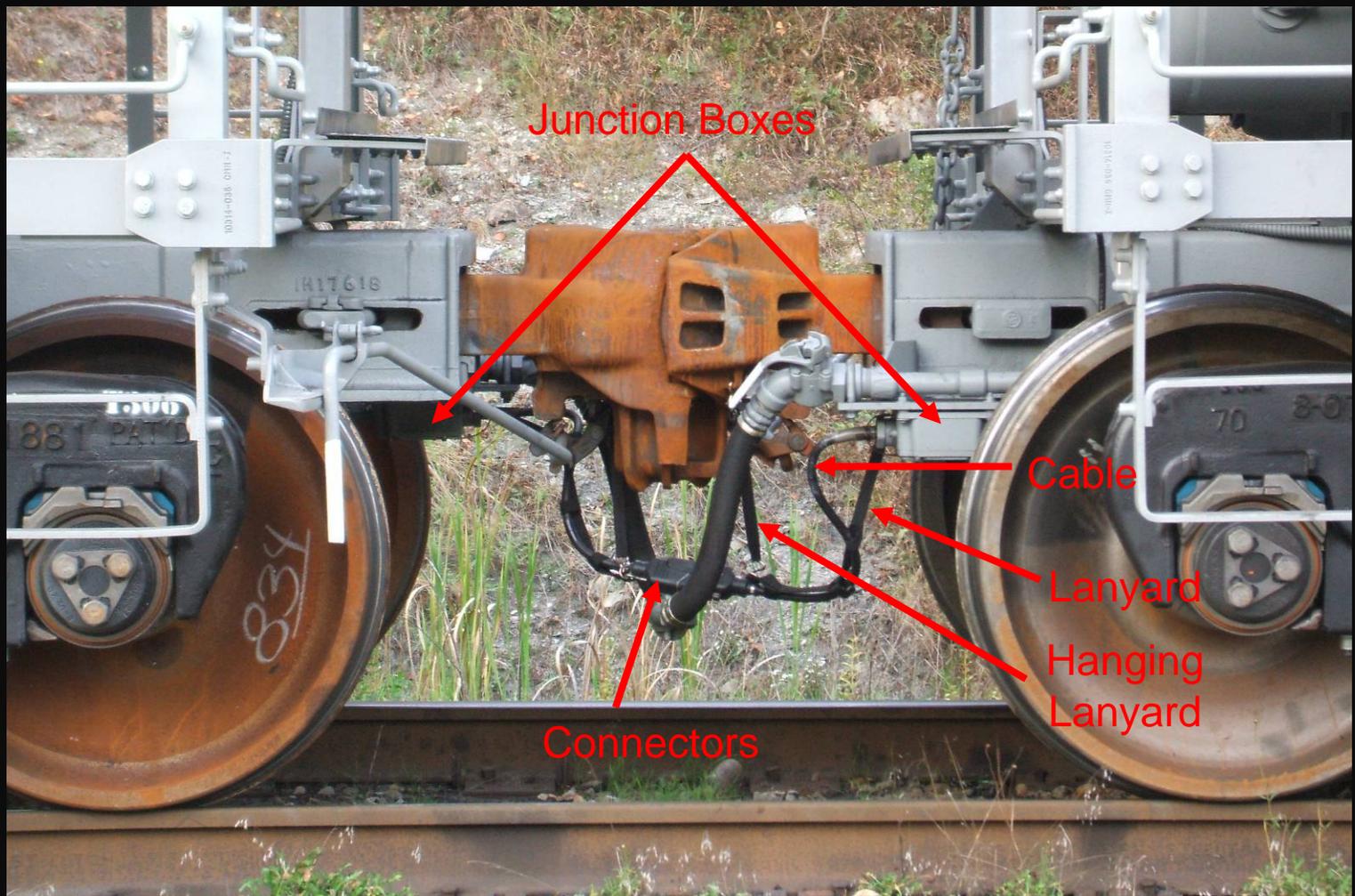
Junction Box

Termination Pigtail

Connectors



Inter-car ECP cable connection

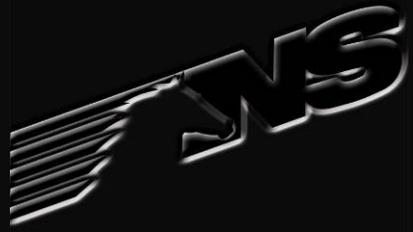




End-of-Train Device

- Provides termination circuitry for train network
- Operates from trainline power or battery
- Sends regular “Beacon” Messages:
 - Brake Pipe Pressure
 - Trainline Voltage
 - Battery Status





A Brief Review

- No Brake Pipe reduction ever made in ECP operation; acts only as air supply
- Train Brake commands carried over ITC – Two wire network runs the length of the train
- AED – Provides network termination and signal to HEU of network connection throughout train