ECP finally taking hold

Thanks largely to a much-needed jump start from the FRA, electronically controlled pneumatic brakes are off and running. Will the momentum last?

By William C. Vantuono, Editor

The freight train of the future may be closer than you think. Picture a mile-long unit coal train originated by BNSF Railway in the Powder River Basin consisting of 100 aluminum hoppers and three head-end locomotives. Its destination is an eastern utility served by Norfolk Southern. Power, depending upon circumstances, is either swapped in and out of the consist or is run-through. The train is equipped with electronically controlled pneumatic (ECP) brakes from three suppliers: New York Air Brake, Wabtec Railway Electronics, and Zeftron. The ECP technology is 100% interoperable.

That's right—100% interoperable. Of all the technologies that have been in various stages of gestation over the past 20 years or more that are considered to form the backbone of "tomorrow's railroad," or whatever you may want to call it, ECP is about the only one in which major stakeholders have agreed upon technical standards. Positive Train Control isn't there yet (though, granted, it's inherently much more complex than ECP). With the Federal Railroad Administration's recent green-lighting of ECP after years of what some in the industry have called a "conversion stalemate" (RA, Nov. 2006, p. 12), the railroads, their customers (to start, electric utilities that lease fleets of coal cars), and the supply community have begun a journey that, when concluded, will see ECP as the standard for interchange cars.

It won't be easy. Interchange ECP service is probably going to take a good 15 years to accomplish, and that's a conservative estimate. The starting point, and it's a logical one if you consider what's involved operationally, is unit coal trains. From there, ECP will progress to intermodal and then work its way through to general-service cars and locomotives. "The North American railroad fleet has approximately 1.4 million operational freight cars and 25,000 locomotives in service," as New York Air Brake's Marshall Beck and Bryan McLaughlin related in a recent presentation. "A recent [Booz Allen Hamilton] report from the FRA addressing ECP deployment issues facing the
industry estimated that converting this fleet to ECP technology would cost approximately $8.6 billion and could take up to 15 years. The report noted that the primary barriers to ECP deployment are the fair distribution of the costs and benefits of conversion and the challenges presented by interchange operations. The costs of ECP conversion fall mainly on the car owner while the benefit accrues to the railroad. Twenty years ago, North American cars were owned mainly by the railroads; today, more than 65% are in private hands. While this change has improved railroad financials, it places most of the capital cost of ECP conversion on car owners. This situation will continue until there is an agreed upon cost-benefit sharing model between the railroads and car owners. The cost of conversion has been estimated as low as $4,000 per car and as high as $8,000, depending upon whom you talk with.

The FRA report also said that unit coal trains, like those serving the Powder River Basin, "pose the fewest interoperability challenges and thus represent the best opportunity to realize the highest return on investment in ECP brakes. The one-time conversion cost for this fleet is estimated by the FRA study to be $432 million, generating an annual return of $170 million. Other unit train operations—carrying non-PRB coal, ore, intermodal containers, or grain—should offer similar returns."

ECP’s foundation, AAR interoperability specification S-4200, was laid down in 1999. Interestingly, even though several tests of ECP involving captive unit trains have been carried out domestically, two heavy-haul AAR-spec foreign roads and one captive Canadian operation have largely proved out ECP’s benefits: South Africa’s Spoornet (NYAB EP-60), Australia’s Queensland Rail (Wabtec), and Canada’s Quebec Cartier Mining (NYAB EP-60). Spoornet also served as the test bed for interoperability between NYAB and Wabtec. Zeifron’s Chameleon Brake technology, described as “a true dual-mode, single-valve emulating brake” because it does not employ conventional control valves, has been dormant for a while following successful testing on unit trains operated by Western Fuels and the Duluth, Missabe & Iron Range (now part of CN) but is poised for a resurgence because of these recent developments.
Chameleon, according to Zeftron General Manager John Anderson, is fully interoperable with the NYAB and Wabtec systems.

ECP freight train braking has been thought about seriously for close to 20 years. (Railway Age published the first of many stories on the technology in 1993). Here's how it works: Unlike conventional air brakes, ECP brakes use an electronic trainline signal, rather than a reduction in brake pipe pressure, to activate the brakes. The electronic signal travels from the locomotive to the cars through the trainline, reaching all cars simultaneously, virtually eliminating run-in and run-out, resulting in improved train handling. The trainline connector is an AAR-standard gladhand-type fastening (devised by Amphenol several years ago) that quickly and easily connects and disconnects. The constant charging of the brake pipe allows continuous charging of air reservoirs. This feature allows multiple brake applications without waiting for recharge, a limiting factor of conventional air brakes. The bi-directional trainline network allows data to travel in both directions (from the locomotive to the cars and back), allowing the engineer to monitor the health of the train's brakes continuously.

ECP benefits are widely known. “They contribute to improved train safety, reduce maintenance costs, lower fuel costs, and improve railroad operations. Stopping distances are reduced by as much as 40%, depending on the size of the train and speed. The elimination of run-in forces improves train handling and reduces wear on couplers and draft gear. The graduated release feature allows finer control of train speed, reducing wheel temperatures. ECP provides continuous diagnostics of the train's air brake status, reducing the need for and associated costs with terminal inspections. And, ECP trains can run at higher average speeds, allowing reduced cycle times.”

Referring to ECP's past tribulations domestically, “We
believe it will hold this time,” says Wabtec Railway Electronics Vice President and General Manager Bob Bourg. “The transition will occur—the question is timing. We’ve done all the heavy lifting at this point.” In addition to the interoperability-based shared SpoorNet contract with NYAB, which will see 6,600 coal cars and 800 locomotives equipped, Wabtec’s technology has been in service on five 74-car trainsets on Queensland Rail’s Hunter Valley line.

FRA Administrator Joe Boardman has been credited with “moral support and regulatory relief,” as Bourg described it. The latter is a waiver (Docket Number FRA-2006-26435) that grants Norfolk Southern and BNSF relief from certain provisions of 49 CFR Part 232 that will permit them to initiate pilot ECP train operations. BNSF and NS “believe that this relief will permit them to implement this pilot program on an expedited basis, allow FRA and the industry to identify definable savings with ECP brake equipped train operations, and evaluate changes to the CFR to accommodate these operations on a permanent basis,” according to the waiver.

BNSF and NS specifically requested, and were granted, relief from the following subsections of 49 CFR Part 232: 232.207 Class IA Brake Test; 232.15(a)(7) Movement of Defective Equipment; 232.103(d) and 232.103(g) General Requirement for Train Braking System; 232.109 Dynamic Brake Requirements; 232.205(c)(3), (c)(4) and (c)(5), 232.209(a)(1) Class II Brake Inspection; 232.211 Class III Brake Inspection; 232.217(c)(3) Train Brake Tests Conducted Using Yard Air; 232.305 Single-Car Airbrake Tests; 232.505(c) Pre-Revenue Service Acceptance Testing Plan. In addition, the two carriers were granted elimination of all Subpart E, End of Train Devices. BNSF and NS did not receive relief from the requirements to perform daily inspections for locomotives (229.21) in service on ECP brake equipped trains, which would have enabled them to perform only a trip inspection.

That’s a whole lot of time-consuming tasks that ECP could eventually help eliminate, provided that safety isn’t compromised. More important, the waiver “should provide a framework for an expedited rulemaking by FRA that will encourage further investment in ECP brake technology throughout the railroad industry.”

Such investment is already under way. NYAB’s EP-60 is being fitted to 235 FreightCar America hybrid aluminum/stainless steel coal cars as well as six GE locomotives being built for NS, which has taken the lead among Class I’s for implementing ECP. BNSF is expected to follow. “The ball is rolling,” says Marshall Beck. “But the industry will need considerable testing and training time. Operating rules and procedures will have to be identified and worked out.”

Those hurdles, it seems, will be easier to overcome than interoperability—a done deal.