Rail Freight Operations:

A Brighter Future with ECP Brakes

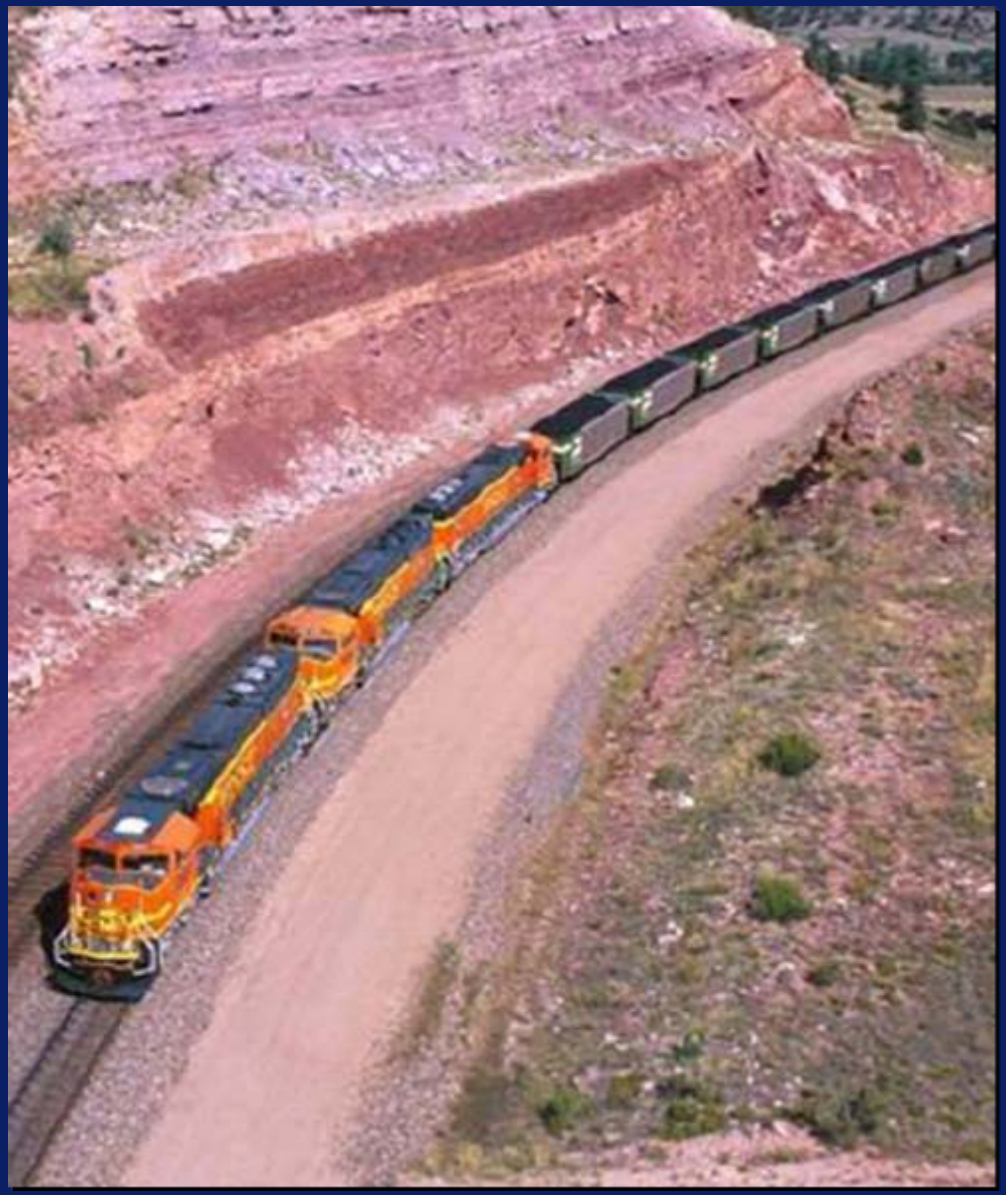
RSAC Meeting
Washington, DC
September 21, 2006

Federal Railroad Administration

Booz | Allen | Hamilton

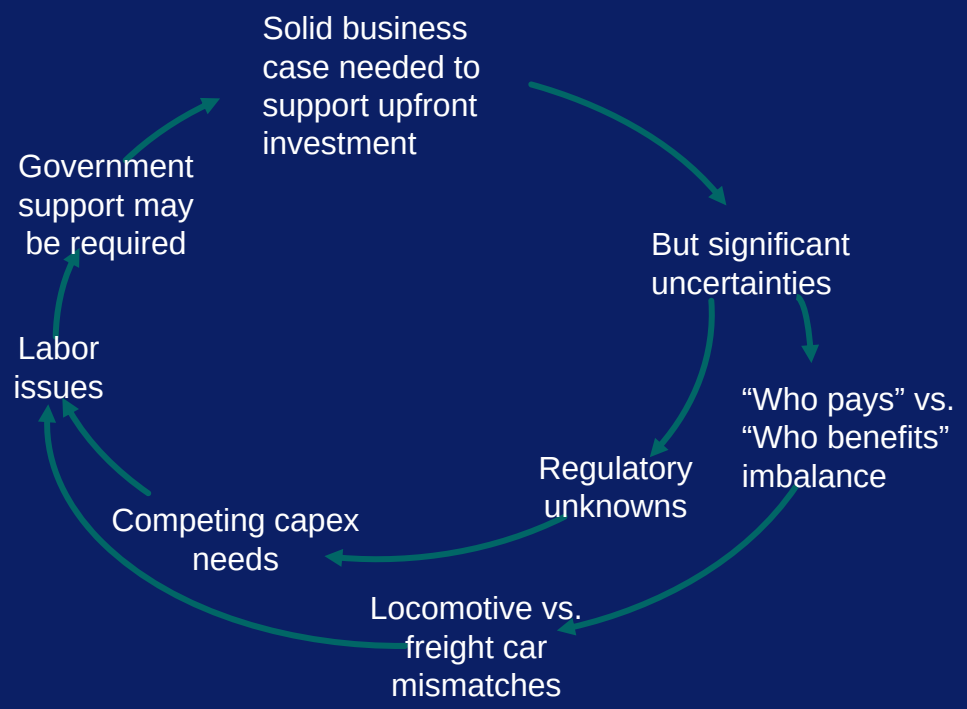
Agenda

- ECP Study Background
- Role of the Expert Panel
- Study Findings
- ECP Internationally
- The Path Forward



Years of ECP experimentation in North America had by 2005 gone nowhere in terms of widespread adoption of the technology

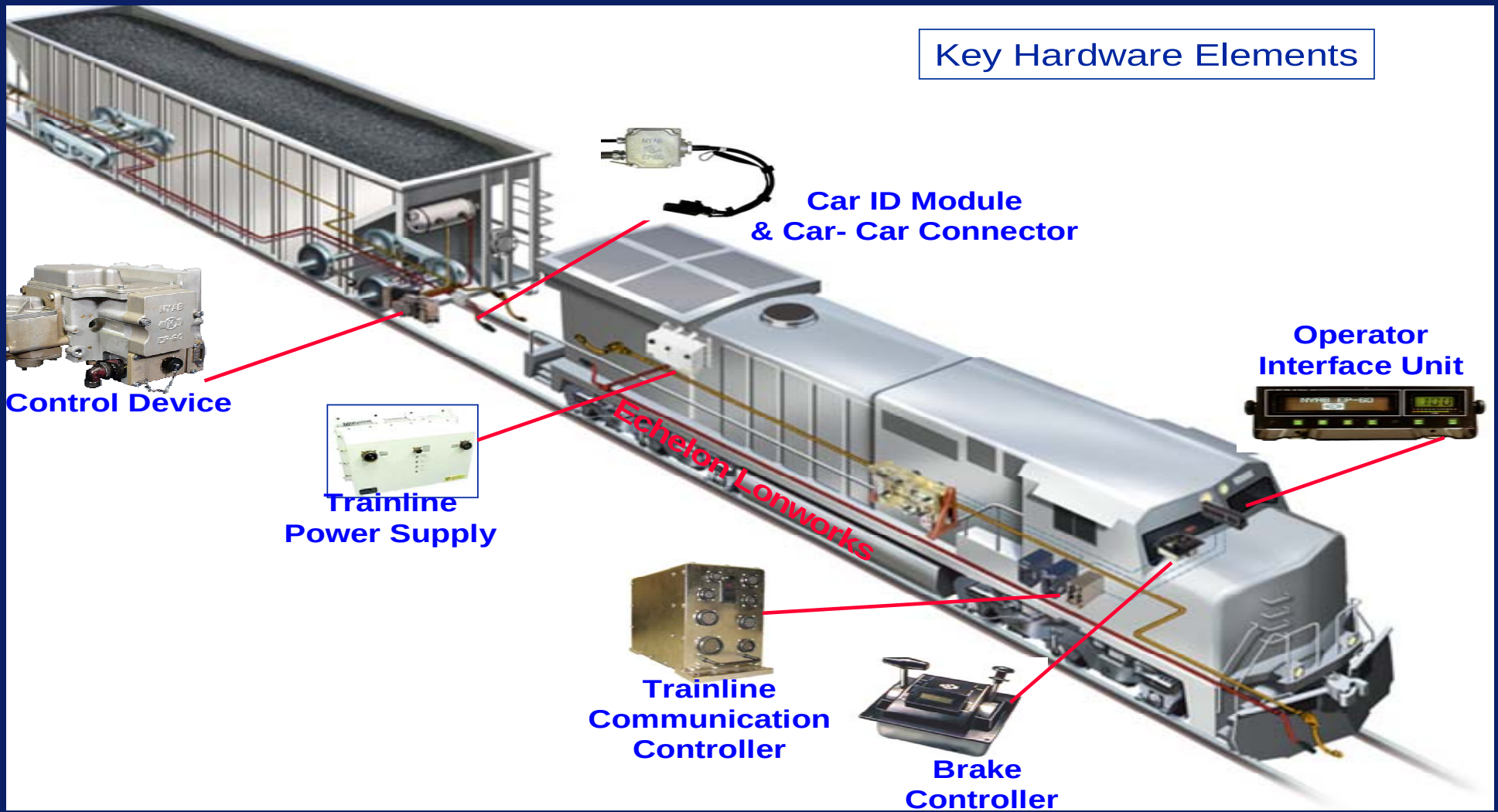
The Cycle of Inaction



ECP Tests and Conversions

- 1995: **BNSF** testing of ECP on selected unit coal, taconite and doublestack trains
- 1995: **CR** testing of ECP on one unit coal train
- 1995: **CP** testing of ECP on one intermodal train
- 1998: **Quebec Cartier Mining** begins converting its iron ore trains to ECP

The AAR approved a wire-based standard for ECP in December 2004, effectively ending wireless vs. wireline debate



Also in late 2004, FRA commissioned this benefit-cost analysis of ECP in an effort to break the decade-plus conversion stalemate

FRA Objectives	Report Response
Assess the business benefits and costs of ECP brakes	Quantified implementation costs and operating benefits
Review the rail safety benefits of ECP	Reviewed safety performance information
Develop three alternative implementation plans for ECP	Set forth and prioritized the three plans
Describe the steps to implementation and the barriers to achievement	Identified seven principles for successful implementation and the risks of inaction

Booz Allen formed an Expert Panel of key investors in ECP to guide the analysis during 2005-06

Railroads	Suppliers	Private Car Owners
BNSF Railway	NYAB	GE Equipment Services Rail Services
Union Pacific	Wabtec Corporation	AEP American Electric Power
Norfolk Southern	ZEFTRON, INC.	Ameren
Association of American Railroads		DTE Energy
TTCI		

The mission of the study was to assess ECP implementation on an industry-wide consensus basis

Expert Panel Objectives

Review Results

- Review benefit-cost and ROI analysis
- Review implementation alternatives and recommendation

Reach Consensus

- Agree on financial analysis
- Agree on benefit-cost leveraged implementation path

Take Action

- Determine roles and responsibilities of each participant
- Determine next steps and action items for each party

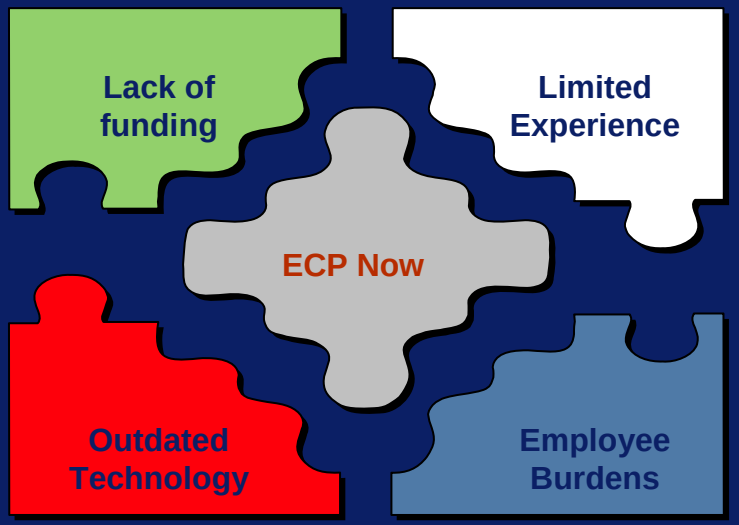
Goal: Stay away from a rigid process that cannot be easily adjusted

Careful implementation of ECP could move the current stagnant situation to a successful technology and ROI end state

Current Situation

No clear path for making the investment in ECP cars and locomotives

Variety of incomplete experiments and proprietary conversions



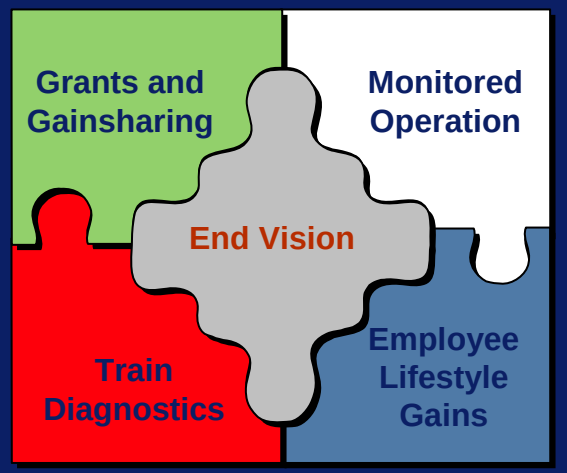
Continued reliance on brake technology invented in the 19th century

Operation of heavy tonnage long-haul trains presents crew training and fatigue obstacles

Phased Implementation

Public private partnerships to generate initial funding

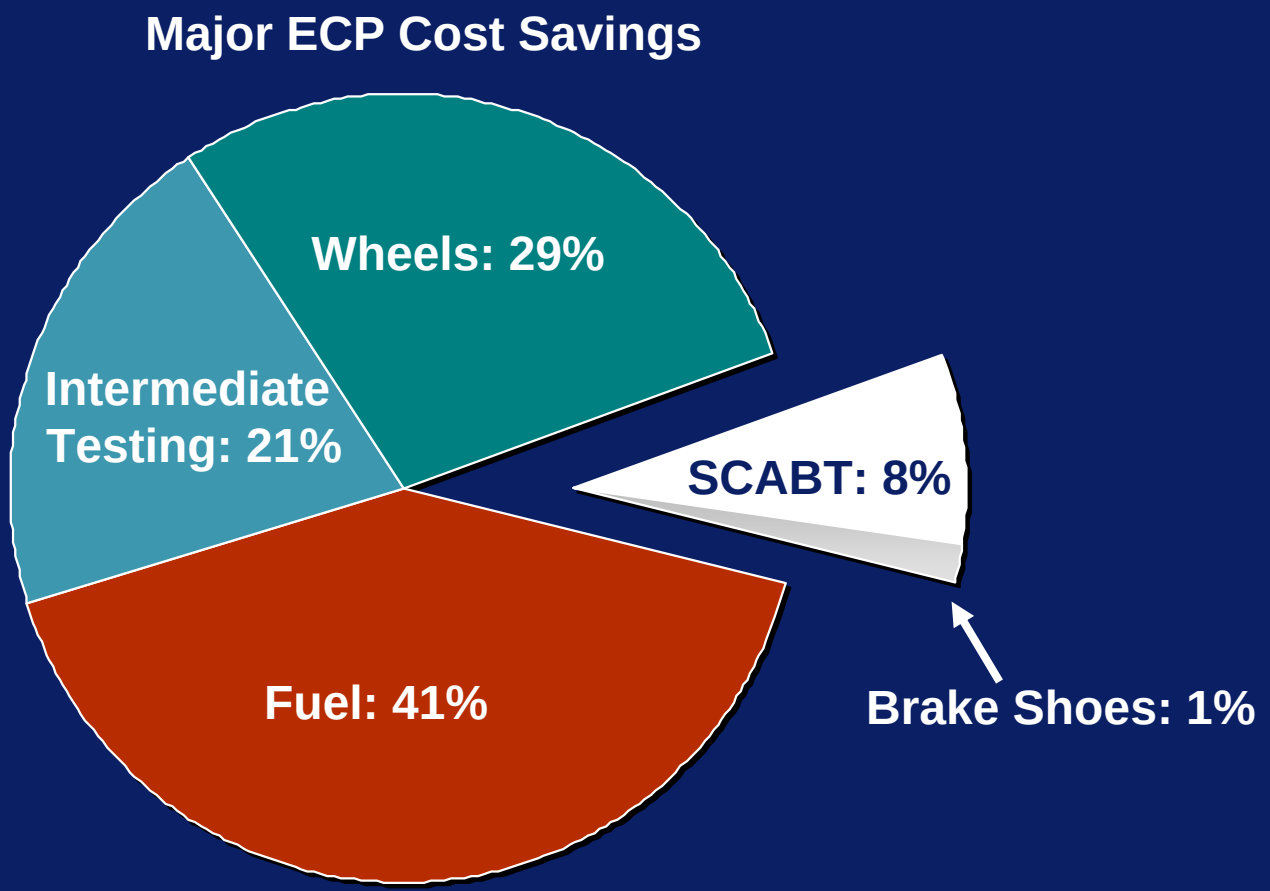
Pre-planned information gathering and analysis with data transparency



Improved train handling and condition monitoring

Eased crew training, supervision, and day-to-day operating demands

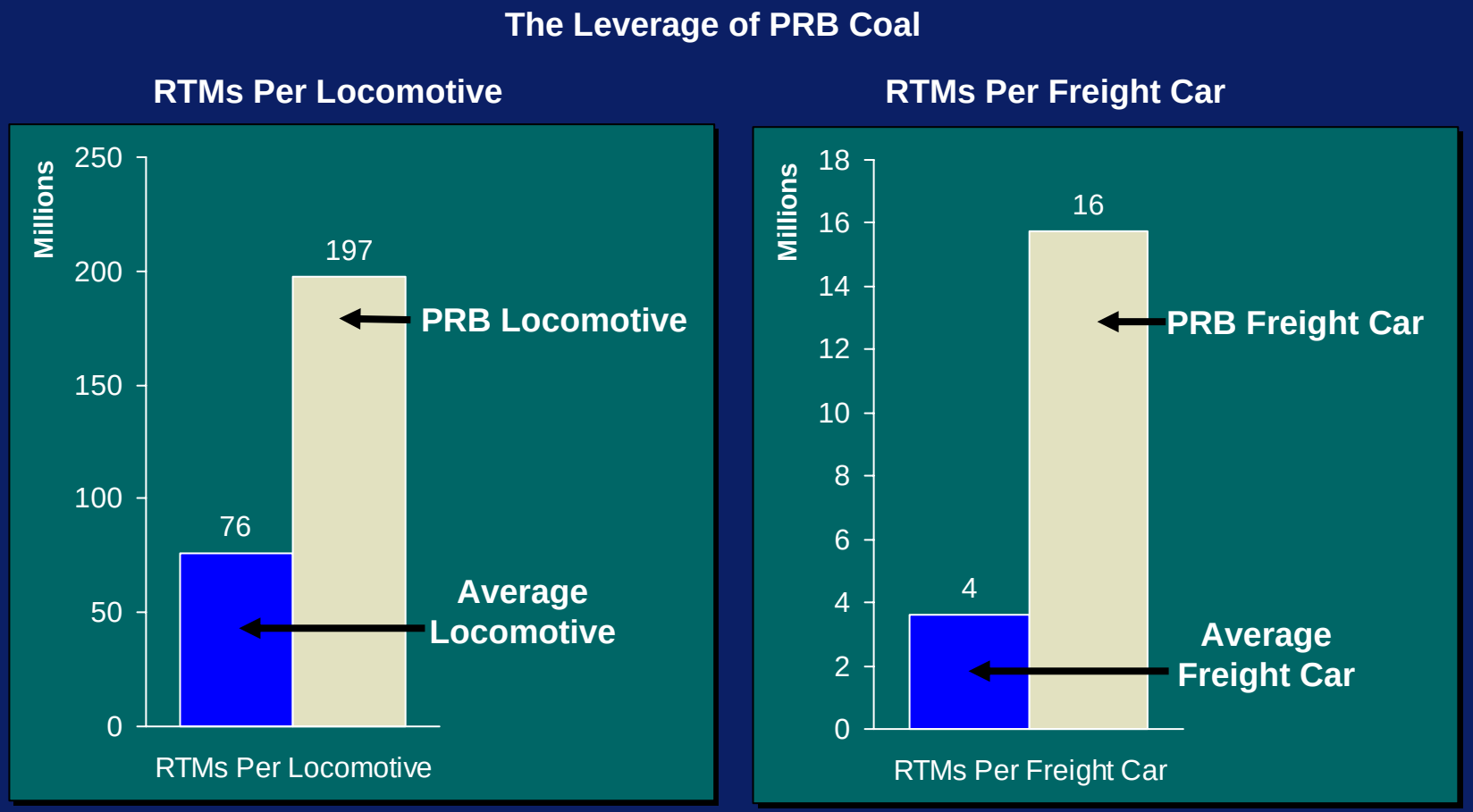
The study found that over 90% of the total non-capacity related savings from ECP lie in three areas: fuel, wheels and brake tests



Total = $600 million per year

Source: Booz Allen analysis

The real leverage of ECP comes from installing it on unit train equipment that generates a disproportionate share of rail RTMs



Source: AAR; Booz Allen analysis

Preliminary financials for the conversion of PRB coal to ECP indicate a 3-year payback, an IRR of 47%, and a $700 million NPV

One-Time Costs	Amount ($ million)	Annual Benefits	Amount ($ million)
Locomotive Conversion @ $40,000 per unit	112	Fuel Savings	78
Freight Car Conversion @ $4,000 per car	320	Reduced Wheel Defects	45
		Brake Inspection Savings	45
		Brake Shoe Savings	2
Total	**432**	**Total**	**170**

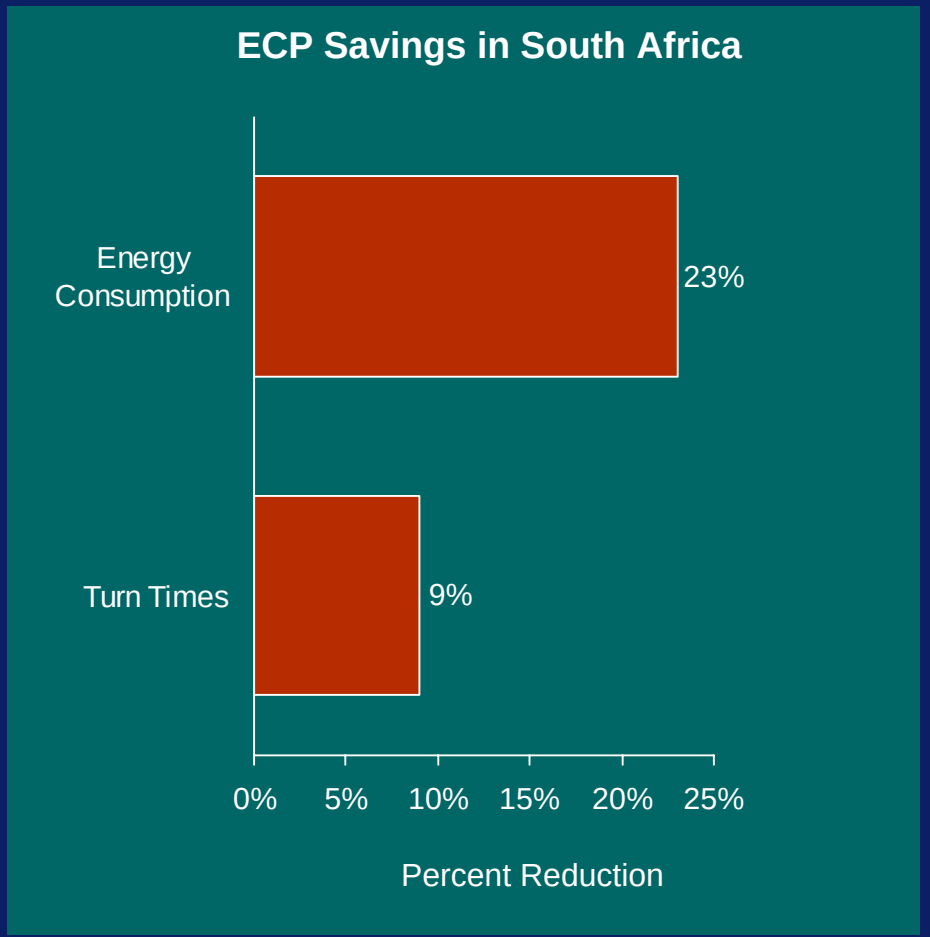
Source: Booz Allen analysis, using a discount rate of 12%

Other countries are adopting ECP to improve capacity; for example, QCM in Canada and QR in Australia run ECP trains

South Africa's Spoornet has operationally and financially justified ECP conversion for its export coal fleet of 6,600 cars

Spoornet made the business case to convert to ECP based on major savings in train costs and gains in capacity

- South Africa's Spoornet has embraced ECP for its huge export coal operations, reporting savings in train energy consumption of 23%
- Spoornet's ECP-equipped cars and locomotives have increased capacity, reducing turn times from mine to port by 9%



Ironically, US ECP manufacturers primary markets are now abroad

Spoornet's preliminary analysis indicates a wide variety of benefits from adoption of ECP

Spoornet ECP/DPC Summary Results

- Stopping Distance Reduction: 60 to 70%
- Max. Tractive In-Train Forces Reduction: 37%
- Max. Braking In-Train Forces Reduction: 23%
- Cycle Time Reduction: 9%
- Energy Savings: 23%
- Dynamic Brake Absorption: 26% Increase
- Wheel Temperature at Bottom of Long Grade:

Statistical Measure	ECP/DP °C	Pneum. °C
99 Percentile	139	280
Average	89	110
Std. Deviation	21	41

Source: Wabtec

Spoornet could have also cost-justified its entire conversion to ECP by avoiding one runaway train handling wreck in May 2005

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‘Wiring the train’ for the first time in North American rail history offers a platform for other safety and efficiency based electronics

Beyond PRB, other unit trains generally lend themselves to ECP conversion, but the costs and benefits will vary by commodity type

Intermodal

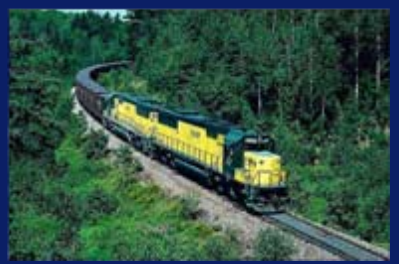
Grain

Non-PRB coal

High Mileage
Dedicated Trains
High Traffic Percentage

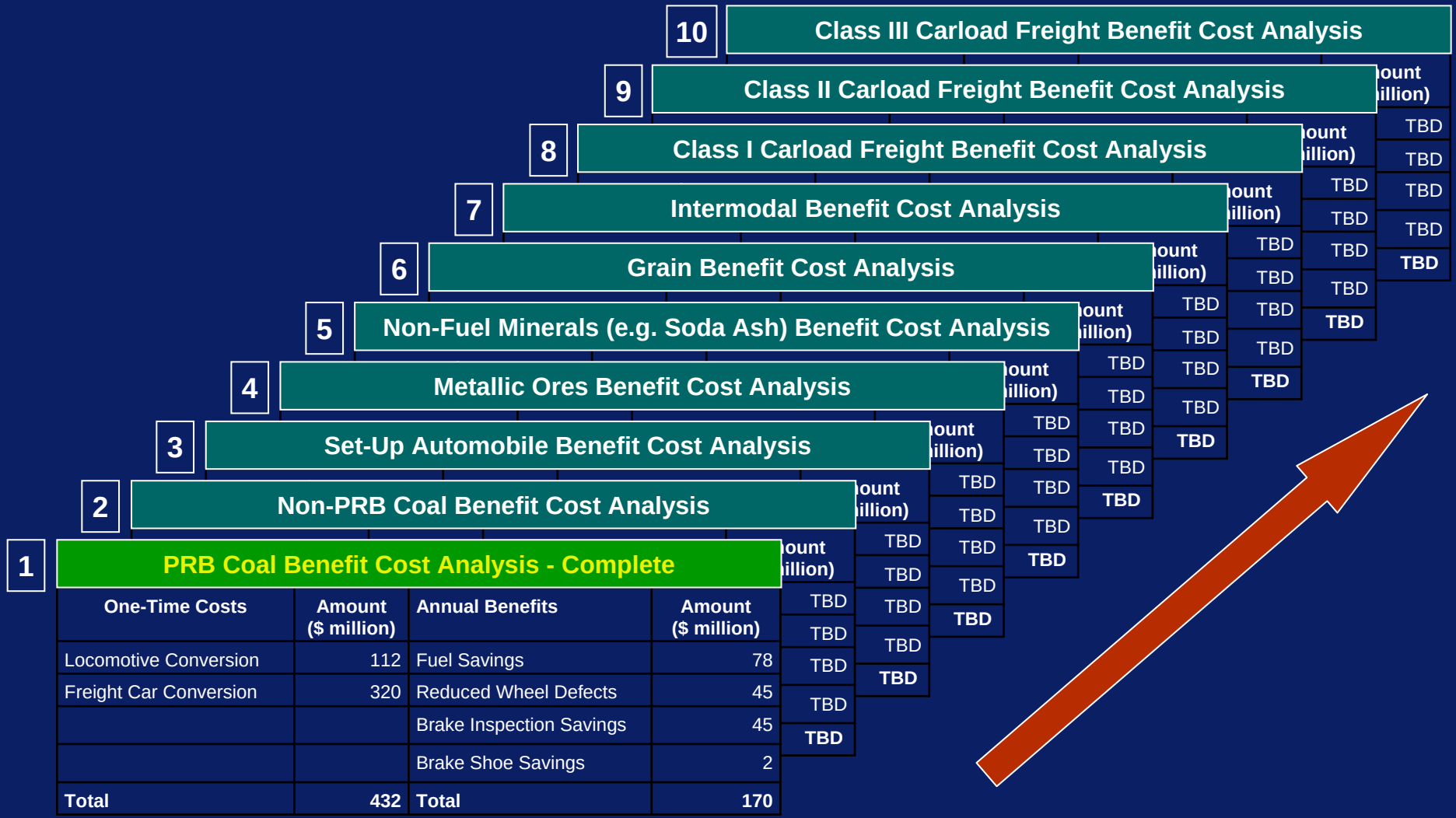
Non-metallic minerals

Ores



Set-up Automobiles

A complete national benefit-cost total for ECP can be produced by completing benefit-cost analyses for 10 rail traffic segments



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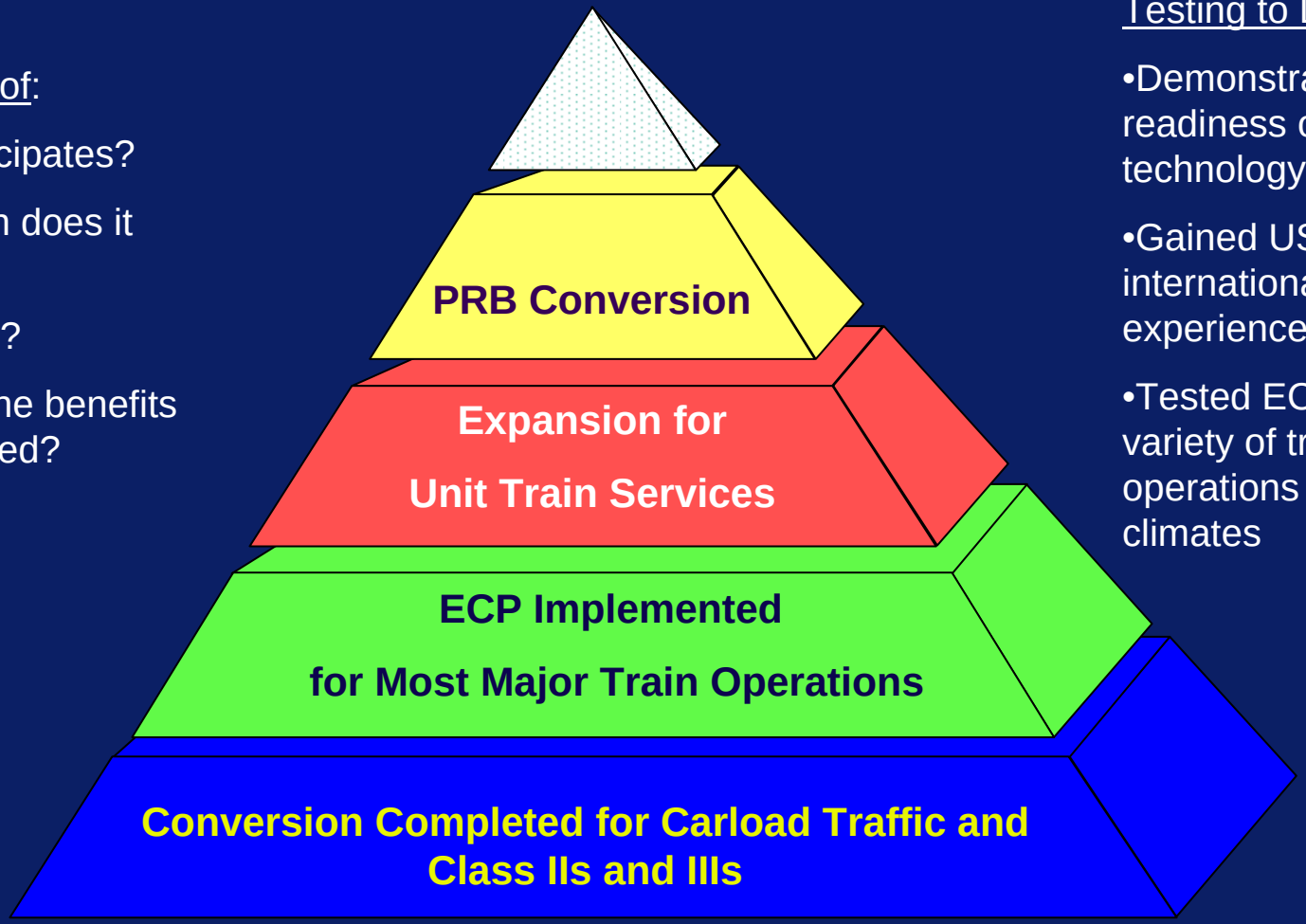
Thoughtful design of the initial ECP conversion is critical to the success of later stages and eventual widespread adoption of ECP

Questions of:

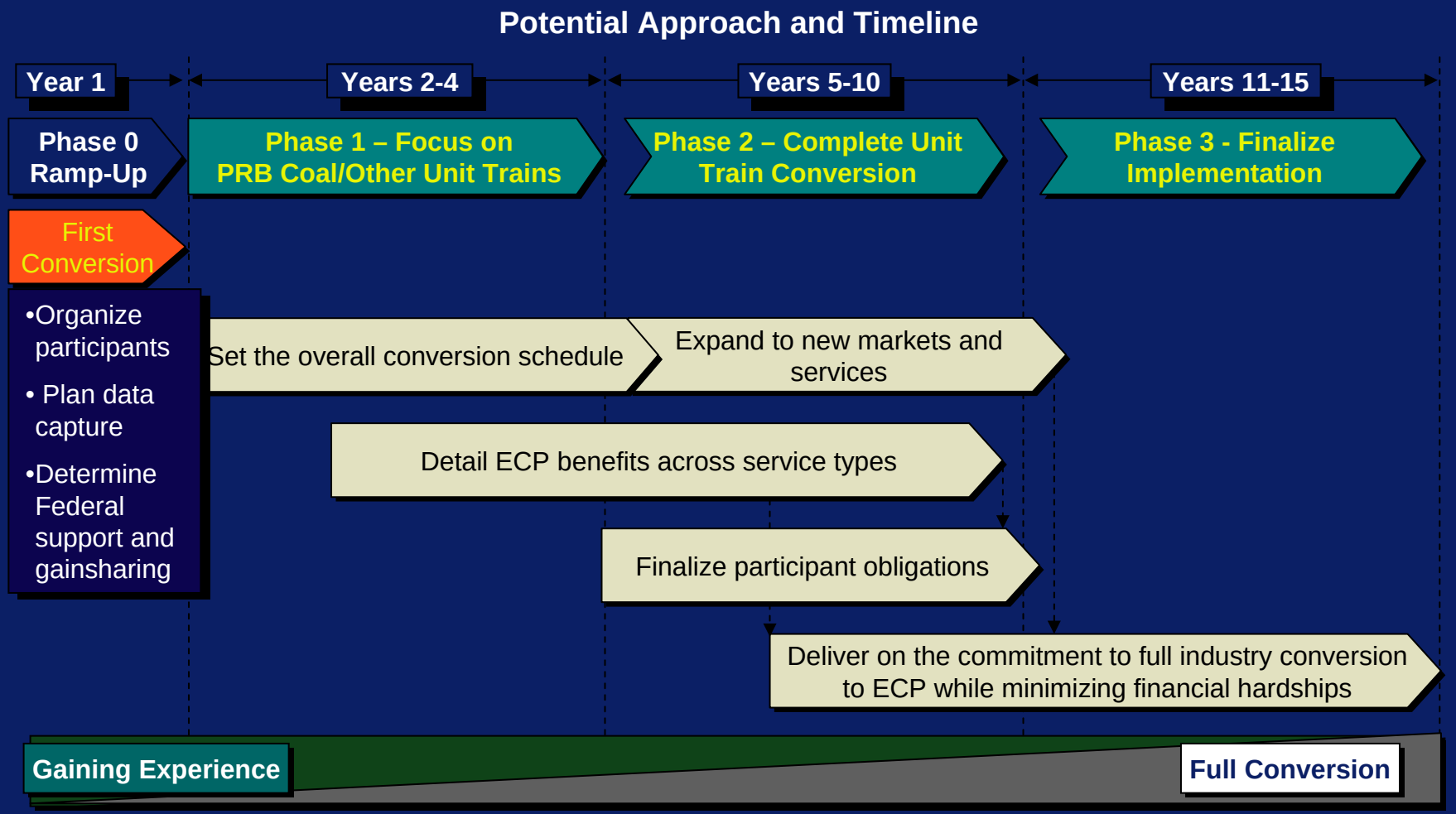
- Who participates?
- How much does it cost?
- Who pays?
- How will the benefits be monitored?



Testing to Date:

- Demonstrated readiness of the technology
- Gained US and international experience
- Tested ECP in a variety of train operations and climates

A sustainable implementation for ECP over, for example, 15 years will require careful phasing of unit train and carload conversions…



…And be driven by seven principles for successful conversion

	Focus	Principle
1	Initial Conversions	Maximize the benefit-cost ratio for the first conversions
2	New Equipment	Require conversion “kits” for all new cars and locomotives
3	Federal Support	Provide incentives through regulatory relief, other programs
4	Gainsharing	Resolve equitably the stakeholder financial imbalance
5	Data Capture	Collect and publish results of the initial conversions
6	Intermediate Conversions	Capitalize on the experience of the initial conversions
7	End State	Set a detailed timetable to make full conversion transparent

Questions or Comments?