Managing New Technology for Railroads

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Challenges of technological change

Identifying need

Finding or developing relevant technologies

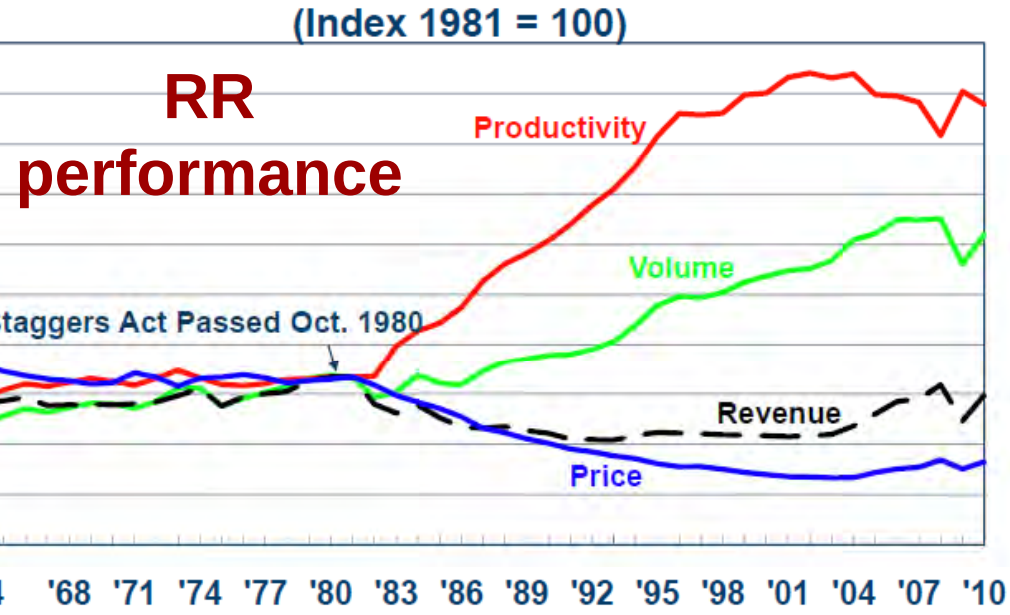
Assessment & validation

Form, fit & functionality (incl. with infrastructure)

Interoperability

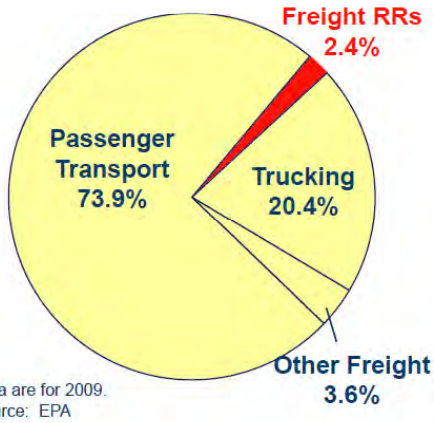
Timeline

RR performance



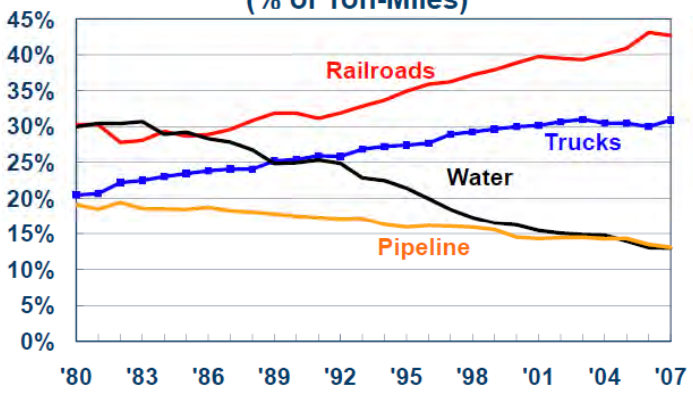
urce: AAR

Transport GHG



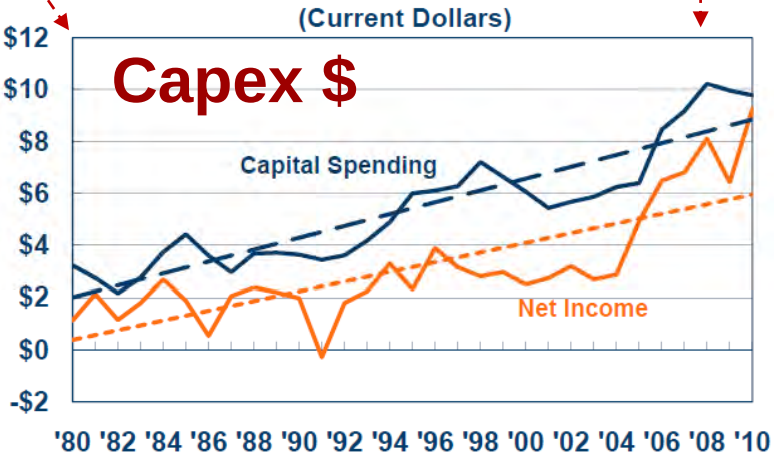
Data are for 2009.
Source: EPA

Freight market share



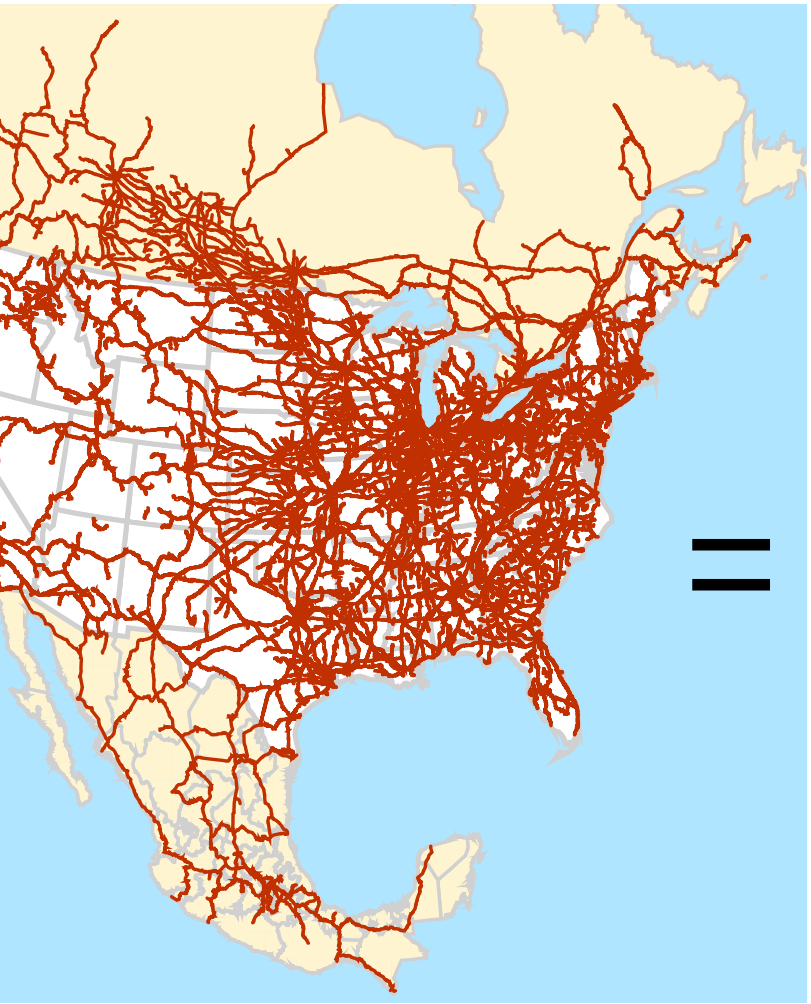
Pipeline excludes natural gas. Source: U.S. DOT

Capex $



Data are for Class I railroads. 2010 is preliminary Source: AAR

RR interoperability: importance



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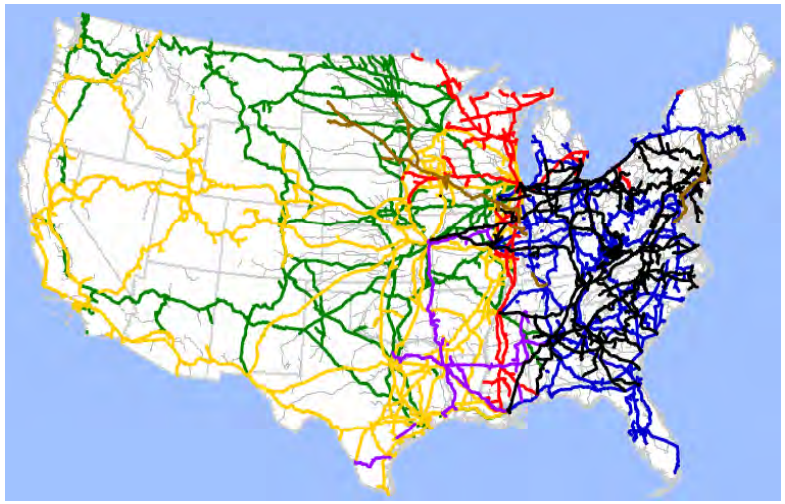

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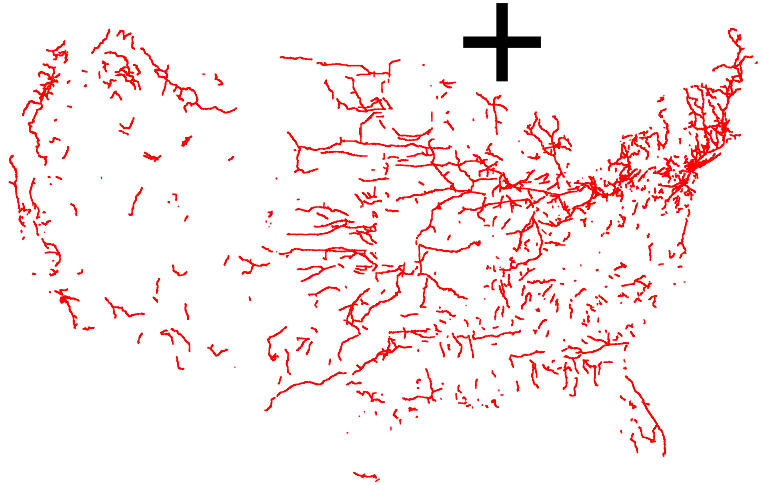
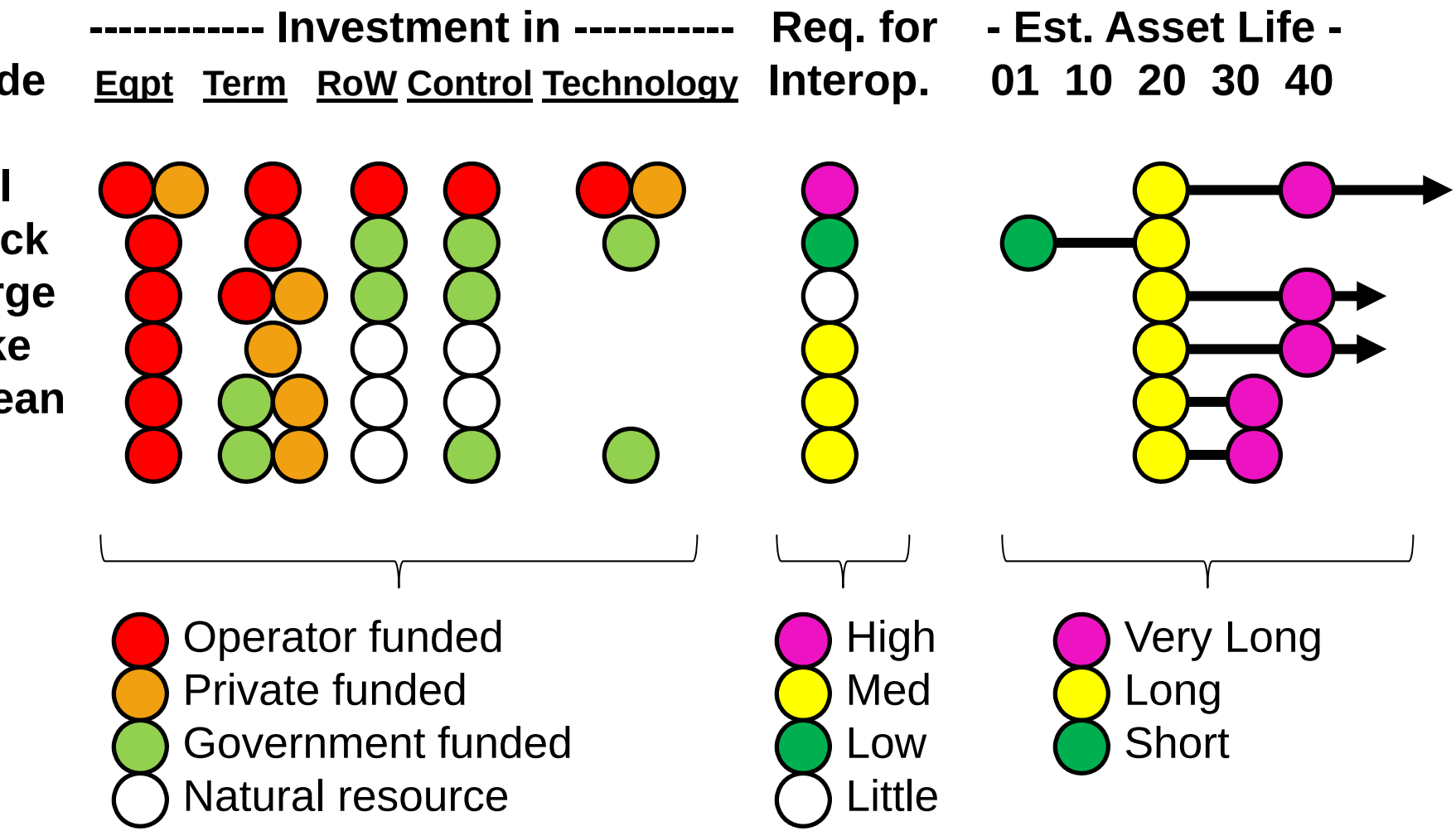


Freight Railroads v other modes



Rail capex needs & decisions

Nuts, bolts, rails, OTM, signals & the rocks underneath

Everything that propels anything which can roll

Locos. typically 20 yr machines; cars up to 40 yrs.

Car ownership split 1:2 (RRs:private)

Fixed plant yrs (rail), decades or century+ (bridges)

Extremely tied to standards & interoperability

Little govt funding of R&D (esp. compared to trucks)

PTC mandate next-4 yrs = exist'g industry Capex 1-yr

EPA Tier 4 loco. aftertreatment comes in 2015

Interoperability, standards, capex & time

*Managers' Misconceptions re Technology

anagers' misconceptions	*Realities*
Best possible	Good enough
Rationally selected	Past practice
Progress as planned	Things will go wrong
Success follows	Future unknowns
Intrinsic value	Customer determines value
Radical change	New not necessarily better
Investment $s	Infrastructure
Enhancements	Standards & routine
Grafted onto exist'g ops.	Jointly made & supported

: Lowell Steele, chief technology officer, GE (1980s), his book "Managing Technology" (McGraw-Hill, 1989, pp 52-67)

Intrinsic value v Customer defined value

ECP (electronically-controlled pneumatic brakes)

- Intrinsic value known (early-’90s)
- Difficult to “graft” into existing network (standalone ECP)
- Regs did not support capex, ROI
- Regulatory relaxation stimulated adoption (mid-’08)
- But capex $ now consumed by PTC mandate (late-’08)

Distributed Power

- Intrinsic value known (early-’70s)
- Past practices & infrastructure limited its use
- Convergence of DP, AC traction & electronic AB (mid-’90s)
- Infrastructure expansion to accommodate longer trains (“)
- DP+(AC) = ~70% of work performed on Union Pacific

Western coal trains, 1984-2011

Productivity improvement required *all* technologies combined

Cars

- Steel to aluminum bodies
- 263K to 286K gross

Locomotives

- DC to AC traction

Distributed power

- Reduced break-in-two risk

Infrastructure changes

- More/longer tracks (load-outs, sidings, yards, multiple mains, etc)

**“The road of discovery, in whatever field,
can always be recognized by the ‘bleached bones’
of those who failed to make the grade,
it takes not only courage, but extraordinary endurance
to sustain the voyager.”**

Lisle F. Small
Executive Engineer, Lima-Hamilton Co.
Industry presentation on free-piston gasifier/turbine technology
September 5, 1949*