This report will attempt to explain and analyze the past ten years, what differed from our previous reports and why, and then give some thought to where intermodal could go in the next ten years. This will cover the North American intermodal network in its entirety, and not evaluate individual carrier's strategies; nor will it cover the short-term effects of current events such as labor situations. Instead, it will analyze the prospects of the North American intermodal network over the long term.

The f rst intermodal report of this "series", from 2002, was "*The Value of Intermodal to the U.S. Economy*", written by Thomas Brown and me. Despite being rather provincial – all rail but particularly intermodal is border-blind – it was an interesting introduction aimed at the less or perhaps fully-uninitiated about this exciting segment, focusing largely on externalities (road congestion, driver shortages, globalization, the rise of Big Box retail - and even as far back as '02- environmental benef ts) and internal factors (railroad capital expenditures, public/private partnerships like the Alameda Corridor in 2016, the last R/R run was on August 25) and called for modal fairness in policy (still an issue).

In 2014, with Tom Brown now at Union Pacif c, our updated white paper was sponsored by the AAR and IANA entitled "*Ten Years After – The Second Intermodal Revolution*". In the twelve years since the f rst report, the railroads have engineered their "renaissance", gained pricing power, and become the darlings of the f nancial community – all while intermodal led all commodities in growth and became the largest rail commodity by volume and by revenue. In 2012, intermodal was the f rst commodity to recover from the effects of the Great Financial Recession. By 2014, at close to the peak of globalization and concurrent success in international intermodal, we saw "the groundwork being laid for…the domestic segment to truly take off." I acknowledged the issue of margin, with intermodal inf ating the overall Operating Ratio (OR) but also noted that:

> In the period 2003-07 Burlington Northern Santa Fe (BNSF) and Canadian National (CN) were the two best stocks in the rail group, which overall easily surpassed the overall market in that period. But in that group of outperformers, why did CN and BNSF stand out? CN was lauded for its OR improvement, but BNSF, growing its intermodal as a percentage of revenue from a quarter to over a third, only improved its OR by 8% (to 77.9%!). But it improved its Return on Invested Capital (ROIC) by a third to 10/5%.

By 2014, Corridors and logistics parks were built, clearances and double tracking (de-bottlenecking) were well advanced, new ports were open, earnings were growing, and shareholders were happy. The future looked so bright, and the report predicted that Intermodal volumes would grow 5-7% in the coming decade, with international maturing to a Gross Domestic Products (GDP)plus levemo Cts imp i r ú k

Then the second half of the decade gave it all back – 2018-23 volume CAGR was a negative 1.7%. The rail market share is now estimated to be 10.7%. This came, remember, in a rising economy. Domestic intermodal under-performed TTX's "Containerizable Production Index". Merely holding shares would have added 13% to their intermodal volumes – and perhaps $2.7B to their revenues! Domestic intermodal, rather than taking off, saw its market share drop from a high of 6.7% in 2018 to a low of 5.6% in the first quarter of last year. Market share now sits at about 6.1% according to Larry Gross, AKA the Intermodalist, which while down from the peak represents a trend reversing increase in share.. Of course, transloading (converting 3 X 40' containers into 2 X 53's, mostly at Los Angeles and Long Beach (LALB)) distorted the numbers.

There are few macroeconomic factors, beyond any carrier's control:

- Port share shifted to the east, where the rail Length of Haul (LOH) is much lower, and the percentage that goes

- *Politics, tariffs and trade wars* – Tariffs in 2017-18 roiled the internal intermodal markets, and some form of de-coupling from China, the United States' largest import trading partner, has changed supply chains around the world by adding new countries and complexities, leading to outcomes that, even now, may not be fully recognized.

- *DE-globalization*

The "lost decade" isn't all because of outside, uncontrollable events. There are at least f ve+ major rail/intermodal self-inf icted wounds to consider.

- *Over-reliance on externalities* – The rails and their IMC partners seemed to wait for the growing Environmental, Social, and Governance (ESG) movement to draw business; the lack of governmental infrastructure spending to shift share; higher fuel prices and the "driver shortage" to spur truckload conversion towards their intermodal units. For the present, one could possibly add "near-shoring" to this list of hoped-for external pressures. ESG is now seen only as a "tiebreaker"; but carbon focus should regain momentum and all of those externalities should be helpful not relied upon solely.

- *Execution* – Rail service, which was on an improving trend line from the start of the century on, began to stall a few years into the decade. By 2015-16, it was noticeably declining, even if slightly. The reasons weren't entirely clear, nor are they now, but the "service stall" was a signif cant factor and led to a strategic redirection at most US rails.

- *Precision Scheduled Railroading (PSR)* – Contrary to common thinking, PSR was introduced into the US after and partially because of service and operating eff ciency deterioration. This might be best exemplif ed by the late Kansas City Southern (KCS) CEO Pat Ottensmeyer's quirky declaration: "Service begets growth". But despite the KCS experience, and the growth through this 10-year period of the Canadian originators of PSR, PSR itself became a toxic phrase and is often blamed for rails lack of growth, or perhaps even a lack of *intention to grow*. This should be examined further. For railroads and their partners and customers:
  - The speed of the CSX implementation of PSR set off a furor, angering both shippers and regulators. This led to embarrassing public hearings and shipper pushback.
  - By 2018, all but one US carrier was undergoing PSR implementation. The one abstaining railway was BNSF, due to the huge impact of unbalanced business (unit train volumes in coal, grain – and intermodal). However, recently BNSF has had some veteran PSR advisors on their staff.
  - The initial impact on intermodal, dating back to the original CN (the "Mothership of PSR") model, is to shrink (or "curate") the business, rethinking the intermodal network and service roster. CN did this in the initial PSR implementation, and reducing the intermodal footprint was publicly acknowledged in this decade by CSX, Union Pacif c (UP) and CN. Rethink, shrink – then grow was the PSR mantra.
  - PSR initially requires severe inward focus (before the "Growth Pivot" to the outside) which inhibits or precludes collaboration and signif cantly changes the risk/reward ratio for risk taking. In other words, aside from the physical changes (reduced footprint) the corporate mental and psychological impacts may be as great or greater.
  - The intensif ed OR focus (see below) An expected outcome from the PSR improvement, margin improvement, became at times the entire focus (a "bastardization" of true PSR according to NS). The efforts to reduce OR led to reduced sales & marketing (and overall) headcounts, and reduced Origin/Destination (O/D) pairs, etc. Some industry insiders have called the network as of this writing "skeletal", noting that the top twelve corridors account for 77% of the volumes. For this reason, as well as others, another veteran decried the shrinking of the "vital and valuable" intermodal channel network.

- *Missed opportunity and lost shipper trust are a bad combination* – Poor execution and an over-reliance on matching supply (capacity) with demand has led to many missed opportunities. One notable example of this can be seen in the peak year of 2018. Trucking regulation led to a well predicted share shift to intermodal, but the network failed to provide adequate box capacity and overall service. Much of the 2018 growth was in Trailer on Flat Car (TOFC), which, when trucking capacity loosened the following year, resulted in those trailers being moved quickly and easily back to the highway. Another example of this is the crew services choking off growth in the pandemic recovery period of 2020-22.

For the most part, the "lost decade" and the PSR effects do not apply to Canada, the home of PSR itself.

- Having completed their PSR implementation earlier, and less controversially – not to mention with no or little Surface Transportation Board (STB) oversight, CN and CP for the most part enjoyed healthy growth and stakeholder relations during this period.

- CN did, however, run into capacity problems in the west in the middle years of this period – they outgrew their network, which led to a few lost years of catch-up.

- CN also suffered shareholder hostility to their growth plan towards the end of this period, which led to a management shakeup. Stability has since been restored.

- CP grew throughout the period after their Growth Pivot (circa 2017) and then initiated the merger to create the CPKC.

For the investment community, the PSR impact was just as seismic, and intertwined with the physical realities on the intermodal network. This effectively created the potential to pit shareholder interests against those of other stakeholders such as shippers, regulators and labor.

- *Not in domestic intermodal, however* – Rail Intermodal is predominantly a contractual business so it was historically

hub to part of their point-to-point international network is a great example of f exible strategic thinking. Will Prince Rupert retain its importance in 2030, or will the railroads benef t more from their investments in effort and capital on the Atlantic coast (CN in Halifax and CP and CSX in St John's)?

- *Add speed* – The original hypothesis from a decade ago meant that by taking time out of lanes, new forms of service-sensitive traff c could be approached, much as by taking cost out of rail operations, new tranches of customers (or LOH or density levels) might now be considered worth the investment.
    - Increased over the road velocity requires more sidings, more IT and strict scheduling. Increased speed in the door-to-door lanes means, perhaps, better terminal throughput. Increased speed on some trains absorbs a disproportionate amount of segment capacity and isn't always worth that cost (as evidenced by the failed experiments to achieve more speed for parcel carriers in the last period). That notwithstanding, improved technology and scheduling could possibly make a new experiment worthwhile.
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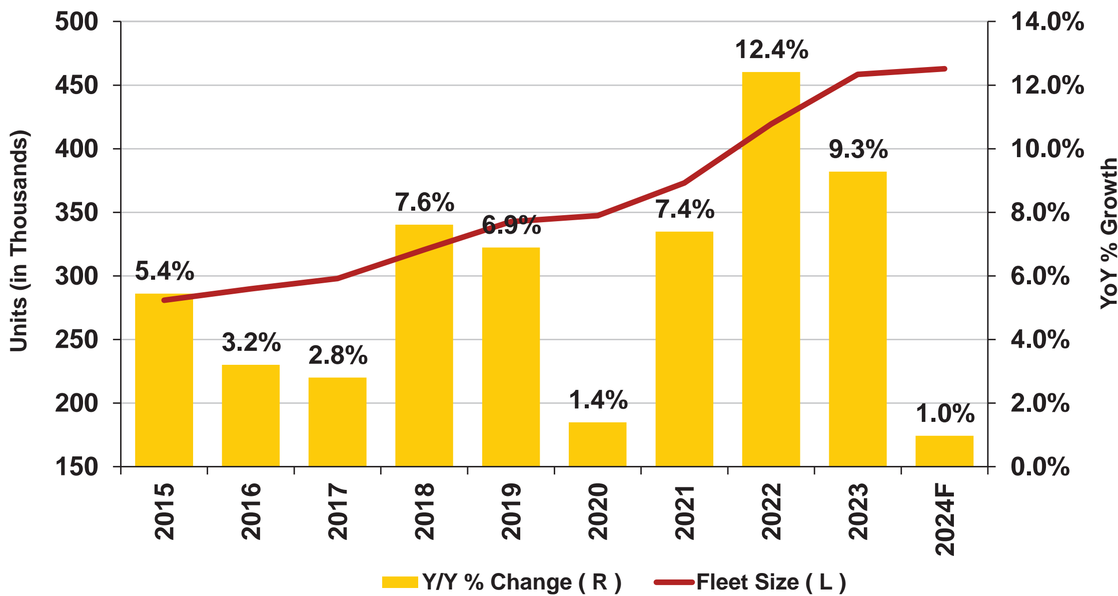
• Will rails simply trade freight with each other, such as potentially to/from Mexico - or grow true volumes?

• Can relatively new measurements like TPC or Rail Services Indices be *consistently* shown to let stakeholders track plan progress before the freight recovery?



As one major Intermodalist told me, "The success of intermodal for the future requires automation." We'll only brief y discuss technology as a risk below, but as an opportunity there are six areas to investigate:

• *Safety and predictive maintenance* – for schedule reliability as well as overall stakeholder rewards.

• *Security* – cross-border and on network to prevent theft or migration. Technology portals, for example, can play in both safety and security.

• *Visibility* – noting that Hapag Lloyd, as well as other ocean carriers, are adding GPS to all of their boxes on the one hand, and the growing acceptance of RailPulse™ as an industry-wide solution (rails large and small, leasing companies, OEMs, shippers) for carload traff c. Visibility technology improvements can also be utilized internally, in terminals.

• *In-terminal management* – this is probably the biggest area, using Artif cial Intelligence (AI) to plan box storage and deployment, shorten gate and dray times, etc. In fact, autonomous vehicles (AV) will likely improve dray and terminal operations well before they actually threaten linehaul. One example of a new storage technology employed by major port operator DP World is BoxBay, whereby containers can be stored 11 stories high and easily utilized, saving on footprint, etc.

• *Attract new markets* – two companies working on EV/AV short haul intermodal technologies include Parallel Systems and Intramotev. The former signed up to conduct a pilot program on GWR's short line Central Georgia – but has been blocked by the Federal Railroad Administration (FRA) – a sign of the biggest obstacle for rails – but not trucks - in employing technology, regulations. This should change under expected incoming FRA Administrator David Fink.

• *Burnish rails' already strong green credentials* – aside from rail and supplier's work on new fuels (CP/CSX on hydrogen, Wabtec on batteries, others) all the above are carbon-reducing. This environmental advantage could be tempered by the policies of the incoming administration.

The CPKC combination is interesting in so many ways. It is very likely the last merger given the STB review rules. It is the first major rail merger in the modern era that is growth oriented; that is to say 80% of the expected benefits come from the revenue side, the complete opposite of the major mergers in the 1990s that created the US' "Big Four", which were 80% or more focused on economies of scale and reducing duplicative effort. But three more things make it a crucial piece of the next ten-year story for intermodal:

- *It is a merger based on end-to-end, single line service advantages* – This serves as a direct competitor in key intermodal lanes that were served by interline combinations, specifically to/from Mexico. Can interline services compete?

- *It greatly increases competition* between railroads which may or may not grow the overall market, depending on

- *A need for cooperation, staying power and network success* – There may be huge opportunities in single line service (CPKC, "Local East", Inland Ports) but that cannot preclude interline focus. The watershed is just the most obvious opportunity. And the opportunity is for the network; no portion can stumble or the effects will be felt everywhere. It is hard, indeed, but the reward is one-price shipping, and almost single-line performance, not to mention market extension for each intermodal ally. Managing growth on the upside (avoiding overf owing the network).

- *Government and Politics:*
  - Trade policy & tariffs and uncertainty, notably in the US; forced changing supply chains; USMCA review in 2026.
  - Immigration policy and its impact on gateways
  - Inf ation
  - Stability and the rule of law, especially contract law, notably in Mexico
  - Environmental policies – this should be a winner for the intermodal ecosphere given their carbon story, but we note the CARB threat in California, for example – a direct threat to BNSF building of "BIG". Under the new federal administration, the CARB threat appears to minimized.
  - Commercial regulation – as a new and obviously competitive business, intermodal has remained exempt from STB oversight. But that doesn't mean the STB itself agrees. And, last year the Environmental Defense Fund (EDF) commissioned a favorable report on the decarbonizing impacts of increased intermodal share – but advocated for more STB regulation to ensure it
  - Technical Regulation and Modal Fairness– noting the Federal Railroad Administration (FRA) pushback on safety technology and regulating two-man crews on a private network while the DOT supports driverless trucking on public roads. Of course, this appears likely to change favorably with the incoming administration.
  - Not In My Back Yard – local efforts that stopped BNSF's efforts to build the Southern California Intermodal Gateway or the delays in CN's Milton hub.

- *Labor*

- *Long Term Strategy versus Short Term Tactics* – The biggest risk aside from, and likely exceeding, those macro factors, is short term tactics, as espoused by the Cult of the OR, as opposed to long term strategy that growth plans require. This is the intermodal freight version of the fable of the tortoise (rails and IMCs) and the hare (short-term thinking). Rails have begun to talk about pivoting to growth, about building resiliency to ensure adequate crew capacity through a cycle, about being measured not (just) by margin (OR) but by earnings and cash f ow growth, and perhaps best of all, by ROIC. And not "just" ROIC, but "through a cycle "ROIC".

- *Deaf – or distracted – ears?* – Unfortunately, they began this discussion in a world still upended by the pandemic effects and now a severe freight recession. Railroads (and IMCs) still talk about growth. Will rails be given the time required to earn shippers' trust? Will they be given the time to prove out new services and lanes? Will they be given the capital needed to add the necessary capacity?

Economy-matching rate seems low and is a signif cant comedown from the heady days of 2014. Of course, the nature of GDP, based on goods and services, comes into account. But there's more: recency bias may be in play – external upheavals, freight recession, labor issues, service deterioration, and investor impatience. Most of these that can be addressed are being addressed. And not everyone was cautious or skeptical – look at the work of Oliver Wyman, or Quantum, or all those involved in Mexico. The EDF thinks intermodal could achieve a doubling of addressable market share by 2035. There are some conditions to be met– i.e. if partnerships are developed and maintained; if adequate capacity is provided; if service levels allow for restored shipper trust, and those levels (and those service offerings are maintained through a cycle) - and if the long-term growth strategists are able to keep the short-term tactical barbarians at the gates. In this scenario the domestic intermodal network has the potential to grow at a level of 2-3+ times GDP without needing a massive new inf ux of capex and can be done with a ROIC that justif es the investment and satisf es the shareholders.