Emergent Issues related to Freight Systems Impacted by the COVID-19 Pandemic

As of 1600 Hours (Eastern) on Friday, March 27, 2020

This document assesses the national freight system that connects demand and supply networks for many critical commodities in order to understand strategic risk and, potentially, offer recommendations.

Consensus Assessment: Based on available data and consultations with industry leaders, the national freight system has to date effectively adapted to significant changes in demand for several sectors. Overall volumes indicate the surge in grocery demand in early March has more than offset declines in demand from businesses classified as non-essential. Departure from carrier contracts indicates that shippers are adapting supply networks to shifts in demand and in sourcing as the virus spreads globally. The most significant impediments to freight flows are public Non-Pharmaceutical Interventions that directly restrict business operations and indirectly signal increased risk among the supply chain workforce. Novel market conditions and virus control measures will continue to challenge shippers and carriers to adapt. Continual monitoring of the freight system backbone will help ensure that FEMA is prepared to help facilitate provision of essential commodities as the nation addresses the health crisis.

Force on Target: Pandemic disease challenges traditional emergency management and business continuity plans. Despite the lack of infrastructure damage common to such planning, the entire population has become a target of concern. Prevalence of COVID-19 does vary in the U.S. (e.g., the New York Metropolitan Statistical Area with population of 19 million has 50.4% of all U.S. cases as of March 25) but is uncertain due to extremely limited surveillance testing. As a result, the public sector broadly imposes mandatory measures restricting travel and commercial operations. While transmission of COVID-19 is implicated, the current threat to freight movement is not caused directly by the disease. For example, virus-related illness has not yet resulted in significant reduction of the workforce. So far, the forces affecting transportation are anxiety-induced consumer demand (aka consumer stockpiling and/or hoarding) and broad government measures, which have made the operating context more uncertain through escalation in official measures to control virus transmission.

Geography Targeted:
Previous ecosystem assessments focused on grocery supply chains in Seattle and NY. This ecosystem assessment focuses on freight flows for the continental U.S. (CONUS). The broad geography makes it difficult to assess risks spanning numerous and varied companies and facilities for a sector-wide supply chain. However, it will identify national-level risks for the freight system that connects the network nodes of numerous sectors. Just as the bloodstream carries vital nutrients throughout the body, the freight system carries essential commodities throughout the nation's communities.

Population Targeted: The entire CONUS population of over 300 million is a potential host for COVID-19.

*The assessment begins with a synthesis of **"sentinel indicators"** regarding freight movement. Sentinels are individuals with experience and insight regarding flow, operating context, and system performance.*

Demand and Supply Networks: COVID-19 has shifted consumer patterns due to anxiety-induced demand in some sectors and business closure in other sectors. Freight broker reports and data below both indicate that the net result is higher overall freight demand in recent weeks. There is less agreement about the trend going forward. Some anticipate a much softer freight market as grocery

demand drops and portions of the economy are shuttered. Others see freight volumes stabilized by higher demand for cleaning and medical supplies and sustained grocery demand, not at panic levels, but sufficient to maintain pantry stockpiles. Freight experts agree that network flows are profoundly shifting as shippers underutilize contracted transportation lanes (origin-destination pair with an agreed price). Actual shipping volumes have increasingly moved to non-contracted lanes indicating deviation from shippers' plans made prior to COVID-19. This is not only due to shifts in demand. International sourcing has been affected by production constraints in China and other countries as the pandemic spreads.

Operating Environment: The context for freight movement, perhaps unimaginable for those not observing China and Italy, is a mixed bag for freight velocity. Non-Pharmaceutical Interventions such as shelter-in-place orders have dramatically reduced competition on the roads and increased speeds. For example, the notorious bottlenecks of I-85 & I-285 in Atlanta and I-710 & I-105 in Los Angeles both averaged 53 mph during rush hour, which is 2-4 times normal speeds. However, anecdotal reports of unexpected business closures and extended delays to load/unload at facilities are rising. One large broker reported that last Monday's median dwell time for Food, Beverage and CPG facilities increased from 90 minutes to 102 minutes (13%) compared with three weeks earlier. Carriers remain concerned about potential virus control measures and report driver confusion as measures like quarantines and rest stop closures were hastily announced and then rescinded. They seek clarity on "safe passage" guidelines to ensure movement across governmental jurisdictions at a time of proliferating restrictions. In China, rapidly implemented driver quarantines halted flows as local impediments had cascading effects on broader freight corridors. Finally, shippers and carriers struggle to define safety practices for social distancing and material handling applicable to their context. Standard health guidance for practical implementation in the supply chain workplace would balance freight velocity, safety, and a personal sense of security for this essential workforce.

Freight Systems: Freight movement can be characterized as a complex adaptive system, and its performance in recent weeks is a prime example. Despite dramatic demand shifts in how citizens access food, fleet capacity is adapting to meet demand. Continual adaptation may be required, as indicated by movements in the spot market (see data below). Driver turnover at large truckload fleets rose to 96% in the third quarter of 2019. While capacity has remained strong nationally, the driver pool may shrink as shuttered operations constrain driver training, license renewal, background checks, and mandatory drug tests. Drivers, who are more than four years older than the average U.S. worker, also face relatively higher risk from the disease. Finally, carriers with fleets less than 100 trucks, which represent 28% of the market capacity, are more vulnerable to cash flow issues if the economy slows.

*Assessment continues with **"data indicators"** regarding freight movement based on indices that draw on an array of data feeds and aggregate data provided by individual companies.*

The Tender Volume Index was established on March 1, 2018, at a national level of 10,000. The national index reflects overall tender growth (e.g. 12,000 would indicate 20% growth) and regional indices reflect market share changes since that time. Tender volumes indicate where demand for trucks is increasing or decreasing and are tracked by inbound and outbound movements for each freight market. Figure 1 shows tender

Figure 1: USA Inbound Tender Volume Index (Freight Waves: ITVI)

volumes for the most recent 12 months (black) and the previous 12 months (green). The recent surge indicates that **national freight flows have risen to meet extraordinary grocery demand**, which has more than offset slowdowns in other sectors. This overall surge has leveled off in recent days.

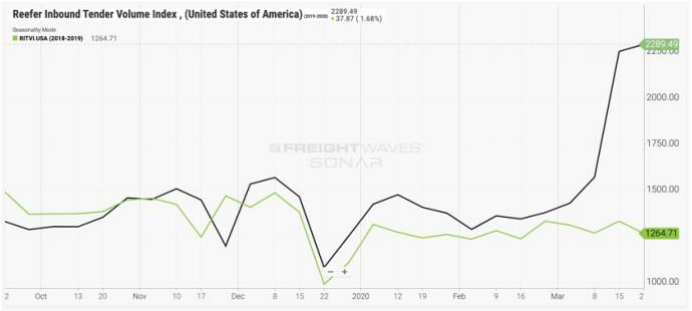

Figure 2: USA Reefer Inbound TVI (Freight Waves: RITVI)

Figure 2 shows the same index but for refrigerated goods. While overall volumes increased around 20% since February, refrigerated volumes nearly doubled from around 1300 to 2300 over the same period. As grocery commodities are a significant part of the refrigerated market, this indicates how much grocery volumes have increased since early March to offset declining demand in other sectors. Note that dramatic growth in refrigerated (reefer) flows started to level off the past week.

Figure 3 breaks down the overall freight market by region. It shows the outbound tenders over the past day, highlighting where shipments originate. Darker blue indicates higher outbound tender volumes from a market, i.e. blue is a supply market. The map indicates supply markets around large warehouse clusters in Dallas/Fort Worth, Atlanta, and eastern Pennsylvania.

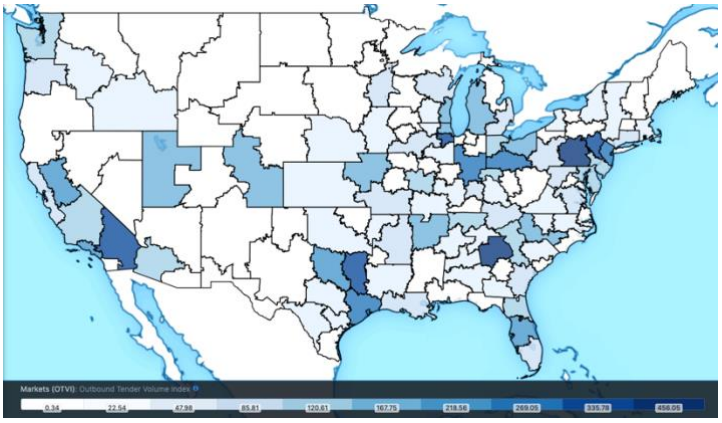

Figure 3: USA Outbound Tender Volume Index for March 26, 2020 (Freight Waves: OTVI)

The Headhaul Index compares outbound and inbound tender volumes. Figure 4 maps this gap for the past day. Blue areas have more tenders for outbound than inbound. This indicates "tight" capacity, which means that trucks are in short supply. Inbound shipments into tight markets are less expensive since there is likely a return load for the driver (aka "backhaul"). Conversely, dark red areas have more inbound tenders than outbound, indicating a "loose" market. Thus, it would be more expensive for inbound shipments to these markets since drivers are less likely to find a backhaul. Combined, these colors indicate the predominant direction of freight flows. For example, markets in eastern Pennsylvania with large distributors have been very tight due as peak volumes are moving into large eastern cities like New York and Philadelphia, which are colored red. In another example, the distinct Dallas and Fort Worth markets,

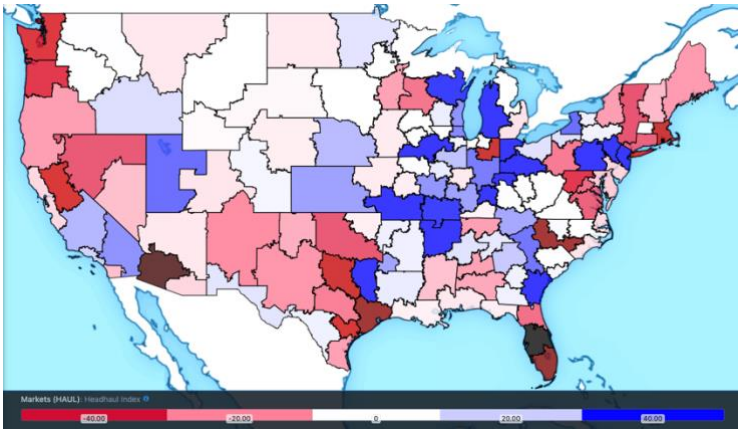

Figure 4: Headhaul Index for March 26, 2020 (Freight Waves: HAUL)

with a line dividing the metro area, are generally supply markets. However, the daily chart indicates a surge in inbound tenders to Fort Worth, turning its daily Headhaul Index red.

While Figures 3 and 4 show daily market conditions, they reflect aspects of the overall market structure for freight movement. One notable exception is that the West Coast, which would normally have attractive backhaul opportunities with large volumes from post Chinese New Year imports, remains a loose market. One common condition worth noting is that **the eastern Pennsylvania corridor is an essential region**; if this area becomes a hot spot like New York City and has to slow down or close, then the impact throughout the Northeast would be significant.

The data above mostly represent contracted fleets. With recent shipper departure from contract plans, we also consider changes in the spot market. They reflect unanticipated changes in demand, especially during times of uncertainty as shippers shift to this market to find additional capacity. Volume and rate information for the spot market provided by Truckstop.com aligns with the volume increases for contract carriers shown above. Load volume for dry van increased by 8% over the past week. At the same time, reefer volume grew 40%. Over the same week, flatbed loads decreased 14%, which may reflect slowdown in non-essential sectors such as construction.

The current strategic context for national freight movement can be summarized as featuring extreme demand, supply network adaptation, capacity adapted to supply network changes, uncertainty in the coming weeks, and the need for public guidance to stabilize an uncertain operating environment.

SCAN is intended to answer two questions:

1. Are key demand and supply networks failing?
2. If so, when, where, why, and with whom can FEMA engage to be most effective in reversing failure?

In the current judgment of the Ecosystem Assessment team, **demand and supply networks that span the nation are *not* failing.** Instead, shippers and carriers have demonstrated remarkable ability to adapt flows and capacities under considerable duress. However, the current freight operations environment is novel in the U.S., justifying close observation of countries facing this pandemic earlier. **The risk of friction, fragmentation, and fear persists.** Regional and local transportation impediments and risk-avoidance behaviors by essential workers should be mitigated by thoughtful implementation of disease interventions and standard guidance for workplace safety. Such efforts enable reliable freight corridors that span jurisdictions and can adapt to demand and supply network shifts. FEMA should **work with states and other jurisdictions to facilitate an operating environment that remains conducive to freight system adaptation.**