$1.73 Billion: The Value of Tailored Warnings of Extreme Weather to Railroads

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“We have a unique opportunity, and the opportunity is huge,” says Steve Branscum, BNSF’s group vice president, Consumer Products Marketing. – BNSF Employee Newsletter

In the United States, there is record demand for rail transportation of both people (www.amtrak.com/ccurl/669/543/Amtrak-Record-Most-Passengers-One-Month-ATK-13-086,0.pdf) and freight. Driving part of the demand are new types of rail transportation vessels developed in the last three decades. These make rail more price-competitive with pipeline and truck and, in some cases, barge transportation. The rail car innovations include:

- Double stack transport of shipping containers
- Wind turbine blade transport
- Truck trailers placed into railroad wheel sets (i.e., Norfolk Southern’s “Triple Crown” service)
- Extended height autoracks which hold up to 11 vehicles and better protect them from in-transit damage than trucks

It is far less expensive to send shipping containers across country by rail with local truck delivery than shipping entirely by truck. In addition to these more recent innovations, there is trailer-on-flatcar intermodal transportation that has existed since the mid-20th Century.

The commonality of each of these methods of rail transport is that they are highly vulnerable to overturning in high winds.

On the Cover
On the evening of September 11, 2013, AccuWeather Enterprise Solutions (AES) provided the BNSF Railway with more than three hours advance notice that flooding would likely develop that evening. Fifty-seven minutes before governmental sources, AES provided BNSF with an explicit warning the flooding was developing. In spite of multiple washouts, all trains and their crews were safe.

Double stack containers traveling cross-country via rail.
According to The Wall Street Journal (August 26, 2013) shipments of crude oil by rail have increased from 9,500 carloads in 2010 to an estimated 389,000 this year. Further growth is projected as pipeline construction projects have stalled.

Similar growth in demand for rail transportation is reported in both Mexico and Canada.

In addition to wind vulnerability, railroad accidents occur when track is washed out, rails kink in extreme heat, or when rails pull-apart in extreme cold. All of these conditions can lead to catastrophic accidents. While it seems obvious, it is worth stating that trains cannot swerve to avoid a hazard and it can take a mile or more to stop a train, especially today.

A new technology known as “distributed power” (locomotives in the middle and/or end of the train as well as pulling on the front) allows trains to be well in excess of a mile in length. These long trains mean stopping distance becomes even more problematic than in the past. With many shippers demanding faster delivery times, the railroads have invested billions in upgrading their track networks for higher speed operations.

Finally, vast areas of the North American rail network are located in areas with little population. In some cases in the West, there is less population than there was one hundred years ago (c.f., http://www.census.gov/prod/2009pubs/p25-1137.pdf ). The movies’ 19th century model of local employees flagging down a train ahead of a flash flood is no longer feasible (if it ever was) because, in many cases, people are no longer situated to perform that task.

While railroads have always treated safety as a top priority, the combination of increased traffic and vulnerability makes the proactive management of the risks posed by extreme weather an operational and economic priority.

Amtrak and each of the Class One freight railroads in the U.S. use AccuWeather Enterprise Solutions (AES) as their weather forecast, storm warning, and extreme weather risk consulting partner. In addition, literally dozens of smaller Class II railroads use our services, as well. AES (then WeatherData, Inc.) began serving the industry in 1987 with a single segment between Kansas City and Tucumcari, NM. AES developed the technique of “track-specific” storm warnings. Train dispatchers do their work in a different geographic world, one of divisions, sub-divisions, control points, and mileposts. It is not uncommon for a track to pass through a small town with the location of the town unknown to the dispatcher.

For example, the BNSF Railway’s “Transcon” (high volume, high-speed route between Chicago and Southern California) passes over El Dorado Lake, Kansas. El Dorado Lake is not marked on the dispatcher’s console. To the dispatcher, that location is “Chelsea.”

In the past, railroad officials had to consult road atlases to attempt to relate National Weather Service warnings to their right-of-way, leading to delays and confusion. In addition, since severe thunderstorm warnings relate to wind (important to railroad operations) or large hail (not important) it was, at best, difficult for railroad personnel to know which warnings were applicable and which were not. AES track-specific warnings are only issued when operationally important weather conditions occur.

For example, during the F-5 intensity Greensburg, Kansas, tornado of May 4, 2007, AES issued a tornado warning for Union Pacific’s Pratt subdivision from mileposts 325 to 342. The warning was issued at 9:12 pm CDT and was valid from 9:30 until 10 pm CDT. The 18-minute interval from the time of issuance to the start of the valid time of the warning gives dispatchers and supervisors knowledge of whether to stop trains immediately or whether there is time to allow them to exit the warned area. In this case, trains were stopped at both ends of the warned track segment. The tornado, which destroyed the town of 1,500, caused no damage to the two trains in the area. If the warning had not been issued, both trains would have been in the path of the tornado endangering the trains’ crews and causing many millions of dollars in damage.
/ Economic Benefits

The Federal Railroad Administration used to provide weather-related accident figures to the public. During the period when those figures were available, Railroad A had AccuWeather Enterprise Solutions (AES) throughout its territory. Railroad B, serving approximately the same geographic region, also had AES, then switched weather information providers and used one that repackaged National Weather Service warnings. Later Railroad B returned to AES. The history illuminates the economic benefits calculated.

During the initial period, when both railroads had AES, the two railroads had approximately the same rate of losses with a slight edge to Railroad B.

During a period when Railroad B used NWS warnings and Railroad A continued to use AES, Railroad B weather-related losses increased by $229,199 per month as compared to A’s. When B returned to AES, their losses returned to approximately the previous value.

During this same period, AES was serving other Class One railroads, as well. Normalizing by route-miles, here is a breakdown of weather-related losses per mile per month over the same period of time.

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<td>$88.68*</td>
<td>$369.38*</td>
<td>$20.00*</td>
<td>Too small to be meaningful (losses were below federal reporting threshold)</td>
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*Dollars per mile

The reason for the much lower figures from C and D is because they are slower average speed railroads than A and B. However, the ratios should still apply. In other words, since using NWS warnings produced 4.2 times the amount of weather related losses then a third lower-speed railroad using NWS warnings would likely have experienced losses on the order of $84 per route-mile per month. While the reporting period was limited, the experience of a fifth (low speed) railroad roughly matched that estimate.

In order to determine the total economic benefit of AccuWeather Enterprise Solutions’ services to the railroad industry, one must apply these figures to each of the railroads served. AES serves Amtrak, all of the U.S. Class One Railroads (Union Pacific, BNSF Railway, Norfolk Southern, CSX, Kansas City Southern), the largest railroad in Canada (Canadian National, both Canadian and U.S. operations), the largest and third largest railroads in Mexico (Ferromex and Ferrosur), and literally dozens of “short line” railroads (examples include the Texas-Mexican Railway, Indiana Railway, etc.).

By applying the above technique (sorting by high speed or low speed railroad) and multiplying the average amount saved per month times the number of months served and summing the result, AccuWeather Enterprise Solutions has saved the Class One Railroads $1.73 billion dollars. If this result seems high, consider that Amtrak and Class II and lower railroads were not included. Therefore, it seems that $1.73 billion as an aggregate amount saved is a conservative number if applied to the industry as a whole over the last 26 years. This is especially true if one factors in inflation (i.e., two blowers in ten days on the Southern Pacific in 1987. The $10 million in damage suffered from these derailments in 1987 dollars equals $17.7 million today).

The economic and societal benefits that meteorology provides to society are often underestimated (see: Warnings: The True Story of How Science Tamed the Weather). This study indicates that proactive risk management by the railroad industry of extreme weather has materially benefited the industry in terms of both profitability and operational efficiency.

Call 814.235.8600 or email us at sales@accuweather.com to learn more about AccuWeather Enterprise Solutions. Visit us at: AccuWeather.com/EnterpriseSolutions.

Mike Smith is a board-certified consulting meteorologist and a Fellow of the American Meteorological Society. He is founder of WeatherData, Inc. which became part of AccuWeather in 2006 and where he now serves as Senior Vice President and Chief Innovation Executive of AccuWeather Enterprise Solutions. Mike is the author of two books, When the Sirens Were Silent and Warnings: The True Story of How Science Tamed the Weather. Mike is a frequent speaker and author on both popular and technical weather-related topics. He has appeared on The Discovery Channel, The History Channel, Fox News, and all of the major networks.