EV Vehicle Ocean Shipping – An Overview of Vehicle Fire Events and Solutions

Late July 2025, Matson, a primary U.S. vehicle carrier serving the Pacific and West Coast regions, has temporarily suspended the transport of electric and plug-in hybrid vehicles due to escalating concerns over fires involving lithium-ion batteries. This move follows several high-profile incidents aboard roll-on/roll-off (Ro-Ro) ships, most recently involving the *Morning Midas* in the North Pacific. (see link to evworld.com story here).

On June 3, the *Morning Midas* caught fire roughly 300 nautical miles southwest of Adak Island, Alaska. The ship was carrying around 3,000 vehicles, including 70 EVs and over 600 hybrids. Smoke was first detected on a deck loaded with electric vehicles. Despite firefighting efforts, the crew was forced to abandon ship. The vessel ultimately sank.

This is the third major fire event on a Ro-Ro vessel involving EVs. Previous incidents include the *Fremantle Highway* in 2023 and the *Felicity Ace* in 2022. In both cases, lithium-ion battery involvement was suspected, raising red flags across the maritime and auto logistics industries.

Matson cited the difficulty in managing lithium-ion fires at sea. These fires can escalate rapidly through thermal runaway and are resistant to traditional firefighting systems. Ro-Ro ships, with their tightly packed car decks and limited access, present additional risks. Matson had implemented safety measures, including thermal imaging and specialized firefighting tools, but concluded that existing protocols remain inadequate for fully loaded EV shipments.

Implications for Global EV Imports

- Island markets like Hawaii, Guam, and Alaska may experience delays or require re-routing of EV shipments.
- Shipping insurance costs are expected to rise, adding to the price of imported EVs.
- Carriers may shift to containerized transport or adopt stricter safety protocols, such as charging limits and dedicated EV zones.
- International regulatory agencies, including the IMO and PHMSA, are reviewing safety guidelines for lithium battery cargoes aboard ocean-going vessels.

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Vehicle Carrier and Deepsea Ro-Ro cargo ship serious fire incidents 2015 – 2025 Q2

Casualty year	Vessel name	GT	Built	Casualty location	P&I club	Operator	Shipowner	Status
2025	*Morning Midas*	46,800	2006	Pacific Ocean	Steamship	SAIC Anji Logistics	Zodiac Maritime	Sank
2025	*Grande Brasile*	56,660	2000	English Channel	Britannia	Grimaldi	Grimaldi	Repaired
2025	*Grande Congo*	47,658	2010	Atlantic Ocean	NorthStandard	Grimaldi	Grimaldi	Repaired
2023	*Ah Shin*	57,449	1999	South China Sea	Japan Mutual	Doriko	Doriko	Repaired
2023	*Fremantle Highway*	59,525	2013	North Sea	Japan Mutual	K Line	K Line	Repaired
2023	*Grande Costa D'Avorio*	47,218	2011	New Jersey, US	North of England	Grimaldi	Grimaldi	Sank
2022	*Felicity Ace*	60,118	2005	North Atlantic	Britannia	MOL	MOL	Sank
2020	*Hoegh Xiamen*	47,232	2010	Jacksonville, US	Gard	Grimaldi	Höegh Autoliners	Total loss
2019	*Diamond Highway*	60,175	2004	South China Sea	Japan Mutual	K Line	K Line	Total loss
2019	*Grande America*	56,642	1997	Bay of Biscay	North of England	Grimaldi	Grimaldi	Total loss
2018	*Sincerity Ace*	59,408	2009	North Pacific	Standard	MOL	MOL	Total loss
2016	*Silver Sky*	39,043	1989	Antwerp, Belgium	Skuld	Sallaum Lines	Sallaum Lines	Total loss
2015	*Courage*	52,288	1991	English Channel	West of England	American Ro-Ro (ARC)	Wallenius Wilhelmsen	Total loss

Source: Lloyd's List Intelligence

Implications for the Overall Automotive Industry – NSVRP Analysis

These safety and insurance concerns extend well past ocean shipping. The impact of vastly higher insurance costs, and the interconnected world vehicle market has implications that threaten the overall manufacture and international viability of the global automobile industry. Vehicles are manufactured at large scale, and then shipped to other markets. The potential severe restrictions on the shipment of vehicles manufactured in one country no longer to be economically shipped to other markets could profoundly impact the industry.

A Deeper Dive into the Problem and Potential Solutions

Round trip Roll-On Roll-Off (RORO) ship cycles loosely extend to about 6+ weeks. For estimating purposes, this would allow for round trips port to return to the same port about 8x - 10x per year. For 1-way product shipping

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of manufactured vehicles each ship with an average of 1000 EVs in a typical load would total roughly 8000 – 10000 EV vehicles per year on a single ship. Assuming for actuarial planning purposes a 10-year mean ship life time until a major fire event at current activity rates, this would imply for actuarial purposes that one major fire event could be assumed in the current environment as plausibly occurring on a ship for every 80,000 – 100,000 EV vehicles shipped.

The two most recent RORO ship commercial losses are estimated to have averaged about $500 million to $600 million each. The average loss amortized from one lost ship from a single EV fire for every 100,000 EV vehicle/trips shipped is about $5K amortized loss per 1-way EV vehicle trip (i.e. $500 million/100,000 vehicles = $5,000). Ignoring any target insurance business underwriting margins, one could estimate that an insurance per EV premium would need to be in the range of >$6k - <$10k per vehicle per vehicle per voyage to support those insurance losses. Also note that this assumption of one triggering ship loss per 100,000 individual EV one-way trips is conservative and may also be underestimating the per trip triggering risk factor calculation. Under less conservative event estimates, the average per vehicle shipped loss amortization factor would even be higher.

Furthermore, while the actual thermal runaway ship loss triggering event rate per vehicle is actually very low – apparently in the range of one event in 80,000 - 100,000 new vehicles shipped – which is a failure rate of less than 0.00125%, it still yields an average actual loss per vehicle that is likely unsupportable to the insurance and shipping industries. The shipping and insurance industries are already reacting defensively to these losses.

These kinds of extremely low failure rates also suggest that the source of failures is unlikely to be a result of manufacturing defects that were not caught at the factory. It is far more likely that these are typically vehicle and material handling incidents damaging the vehicles after they leave the factory and which are causing the infrequent thermal runaway events on ships.

1) **The shortest-term practical mitigation solutions** should start with vehicle gatekeeping to identify and reject higher thermal runaway (TR) event candidate EV vehicles before they are allowed to be loaded on a ship. This is the quickest response available other than prohibiting any EV vehicle shipping. Even if not 100% effective, this could potentially catch the most of the thermal runaway candidates, and given that the risk window of an EV vehicle once loaded on a ship is only 2-6 weeks duration, this could very substantially reduce the on-board ship thermal runaway event frequency.

The immediate available solution that seems appropriate is a method to screen each vehicle just prior to loading so as to catch impaired vehicles after their last handling by a forklift or other heavy equipment, and in their pre-loading storage areas just prior to being driven onto the RORO ship.

The method used must be labor and time efficient, with accurate diagnostics, which is also secure and which does not negatively impact the port operations or add material management complexities to the shipping

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operation. It must allow for good management intelligence data, and seamlessly integrate with the other long-term national Track and Trace policy objectives of the US and EU goals. Implementation of this kind of method and process as a first-stage working solution is **currently feasible and available**.

2) **Secondly, it is vitally important** that work must be done on methods to reduce the impact of a Thermal Runaway (TR) event that results in the loss of a ship and its cargo. If a TR event resulted in minimal damage to a ship and thereby avoided the loss of the ship and the other vehicles in the ship, the economics of actuarial insurance losses would change dramatically for the better.

This second layer of defense is to create a strategy to address a TR incident when it does occur. Once on a ship, the logical objective for addressing a TR EV vehicle fire may not actually be on focusing all efforts to put out the fire, but rather the primary objective should be to eliminate the threat of the fire spreading to other vehicles and to recognize that the top goal is the protection of the ship and the crew.

The best way to accomplish that may in fact to rethink our approaches to fire response protocols on a ship. The primary focus may require strategic thinking on ship defense first, and on putting out the fire on the vehicle second. The best strategy may be to first temporarily contain the fire to the immediate vehicle, and to concentrate on a method to totally isolate the compromised vehicle in place protecting the ship and the rest of the cargo. Once the vehicle is isolated in place and secure, to then finally neutralize the vehicle without the risk of impacting the rest of the vehicles or the ship. A successful implementation of this approach would convert a very infrequent TR event from a $500 million-dollar loss into at most a several hundred thousand-dollar loss. This would change the overall insurance risk analysis and eliminate the critical financial threat to the EV vehicle export model. **These kinds of solutions can be pilot-tested and implemented in the near term**.

3) **Lastly, vehicles should be designed going forward** to be actively self-monitoring for state of health, state of charge at both the cell level and battery level - and to report that to the driver and via telematics to the OEM.

In the long run each vehicle manufacturer should eventually design of intelligent monitoring by the vehicle itself of the battery identity, operating status and SOH, SOC and other parameters. This is both at the battery level and cell level. Any material change in the health should be altered to the driver and via telematics to the OEM. Those kinds of vehicle design changes may take years to implement, but should be a longer-term objective.

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