High Pressure Relief Systems in LNG Receiving Terminals – A Safety Case for HP Flare

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Worldwide demand for LNG has been on a steady increase leading to design and construction of larger receiving terminals (from about 2.5MMTPA to 15MMTPA) in recent years. However, many of the standard design features have been implemented directly to the new large capacity terminals without revalidating the adequacy of such design. In particular, unlike other industries where hydrocarbon vents are connected to flare system, it is common practice to route Pressure Safety Valves (PSVs) discharges on vaporisers (operating between 50 to 100barg) to atmosphere directly. The relief loads from one single vaporiser has increased from 50 tonnes/hour in the past to the latest 300 tonnes/hour. It has now become a challenge to discharging such large quantity of flammable gas through atmospheric vents in a safe manner. Not to mention during events such as blockage of the sendout pipeline, simultaneous relief of all PSVs from multiple vaporiser may increase the total discharge rate to more than 1000 tonnes/hour. High thermal radiation arise from the ignition of such release may lead to damage of nearby equipment, piping and structures as well as personnel injury/ fatality. To count such effect, designer has transformed PSV discharge from simple tail pipes to multiple vent stacks with elevation more than 20m.

The objective of this paper is to assess the hazards (possible consequences and likelihood) due to flammable gas release from PSVs to atmosphere with respect to personnel safety, asset and plant unavailability. The result will be used to evaluate the potential cost benefits of introducing high-pressure flare system taking into account the associated implementation/ operation cost (e.g. extra land). Also, it is in the author’s opinion that such flare system can also provide the possibility of implementing emergency depressurisation system in LNG terminals.