LOPA: PERFORMED WHEN AND BY WHOM

Many users of LOPA do not know when to use LOPA and so they overuse this tool; and they do not know who should be doing LOPA, so they many times use a team, similar to or the same as a PHA/HAZOP team. This presentation explains what the originators of LOPA intended and why, and also brings the industry up-to-date on the lessons learned from different approaches to using LOPA, related to when to do LOPA and who should do LOPA.

WHEN: Timing

WHEN	PRO	CONS	
During the PHA, scenario by scenario	Scenarios are fresh in mind of personnel If the Process Safety Information is in the minds of personnel (not well-documented), they may be able to answer questions	Counterproductive to switch from PHA brainstorming (inductive) to LOPA (deductive) thought process All the hazards and candidate IPLs have not been identified yet Wastes time of PHA team May lack needed expertise	NOT RECOMMENDED
During PHA, at the end of a major HAZOP section when scenarios are complete	Scenarios are fresh in mind of personnel All the hazards and candidate IPLs should have been identified If the Process Safety Information is in the minds of personnel (not well-documented), they may be able to answer questions	Counterproductive to switch from PHA brainstorming to LOPA thought process Wastes time of PHA team May lack needed expertise	NOT RECOMMENDED
Outside of PHA	Provides efficient use of personnel time	Requires well documented Process Safety Information Requires well documented PHA	RECOMMENDED

WHEN: Trigger

WHEN	PRO	CONS	
Every scenario	Appears to be thorough, but is appearance only	Overkill, waste about 30% of PHA team's meeting time Review can easily become superficial	NOT RECOMMENDED
All scenarios that have fatality	Good training for PHA Leaders that are not familiar with failure & error rates Good practice for organizations that are just starting to use LOPA Conservative. It is a good starting point for risk reduction.	May be more work than required (waste valuable engineering/analyst resources) LOPA does not work for all fatality scenarios, so you will have to bend rules	RECOMMENDED **when the PHA Leader is NOT a trained and vetted LOPA analyst**
All scenarios that have or require a SIF To determine the target SIL	Good training for PHA Leaders that are not familiar with failure & error rates Good practice for organizations that are just starting to use LOPA Conservative. It is a good starting point for risk reduction.	Is definitely more work than required. LOPA does not work for all fatality scenarios, so you will have to bend rules	RECOMMENDED **when the PHA Leader is NOT a trained and vetted LOPA analyst and does not have a fundamental understanding of SIS**
Scenarios recommended by the PHA team . When the PHA team is not sure. . When the scenario is complex.	LOPA is done only for the scenarios that are too confusing for the PHA/HAZOP team to make a Good risk judgment Efficient	PHA team (without LOPA) may feel comfortable with serious consequence scenarios that do not have sufficient IPLs Requires PHA leader who thoroughly understands LOPA principles, especially independence rules and the basics of SIS. Requires knowledge and expertise on the PHA team.	RECOMMENDED **when the PHA Leader is a trained and vetted LOPA analyst**

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Bill is President of PII. He has a BS and MS degree in Chemical Engineering.
Bill has over 38 years of chemical industry experience in operations, process engineering, management, safety evaluation, including 13 years of hands-on (plant) experience. Bill and Art are principal authors of the LOPA book for CCPS/AIChE (2001) and Bill is primary author of *Guidelines for Initiating Events and Independent Protection Layers*, CCPS/AIChE (2015). Bill is also a Certified Functional Safety Professional (CFSP).

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Art has a BA and BS in Chemical Engineering and has 50 years of process safety experience, including 42 years at Rohm & Haas; now The Dow Chemical Company. Art has published more than 50 papers, many on PHA, LOPA, and SIS implementation.
PII has helped more than a hundred companies implement process safety since 2003. This includes leading hundreds of PHAs for both new projects and existing plants and training more than 4000 PHA leaders and scribes. PII staff has performed more than 1000 LOPA for more than 1000 SIL Verification.

WHO

Full PHA Team	NOT RECOMMENDED
Full PHA Team plus instrumentation and control engineer	NOT RECOMMENDED
LOPA analyst (with some help, for 1.5 average team size) • **Process engineer** (by phone/email, as needed) • **Other expertise** (by phone/email, as needed)	RECOMMENDED

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