ANSI / API RP-754

Process Safety Performance Indicators for the
Refining & Petrochemical Industries

Part 4: Implementation of RP-754

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Welcome and thank you for joining us for the last in a series of four webinars to discuss the content and implementation of the new ANSI/API Recommended Practice 754, Process Safety Performance Indicators for the Refining and Petrochemical Industries.

All four webinars are being recorded for future playback on the API website.

My name is Dawn Wurst and I am the Safety Director for Flint Hills Resources' Pine Bend Refinery and it was my pleasure to serve as a member of the RP-754 drafting committee.

Following the presentation, there will be an opportunity for questions and answers.

Let's get started.

In this session we will be covering the data necessary to implement API 754, an overview of the general work process, and also how the data can be used for your company's and employee's benefit to improve your PSM program.

I will also be sharing some examples along the way to help you picture what real-life implementation looks like.
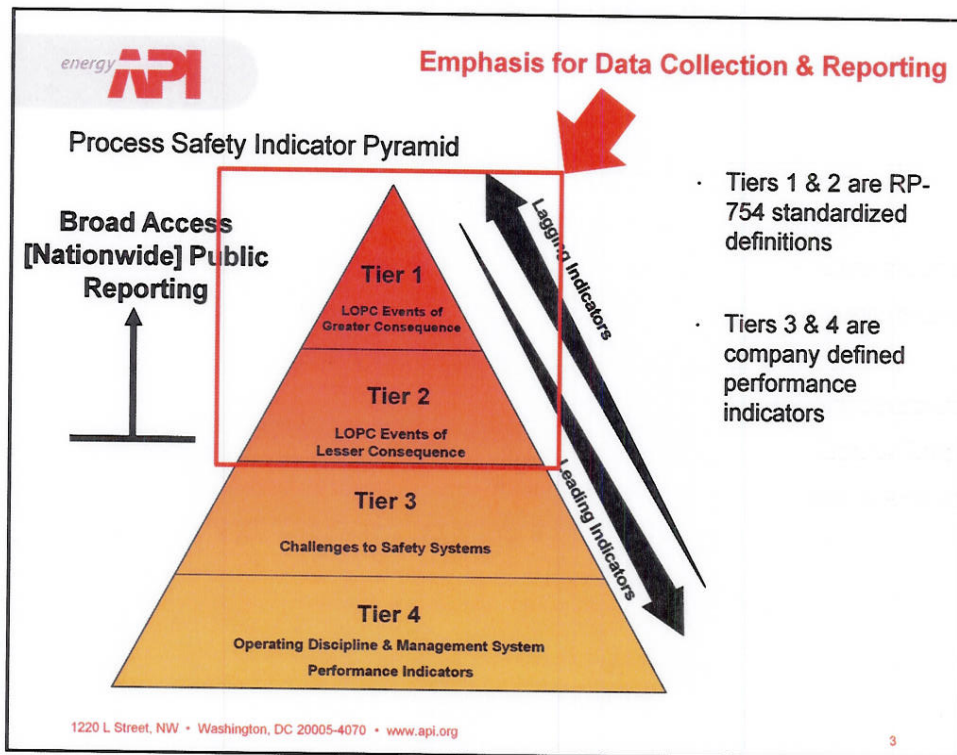
•TRANSITION TO NEXT SLIDE

Implementation of RP-754

- Background
- Implementation Process
- PSE Data Capture
- Introduction to Recordkeeping Spreadsheet
- Useful References & Examples
- Data Analysis Examples
- "What's in it for me?"
- Where to go for help

This webinar is focused on implementation. If you are looking for further detail on the structure or purpose behind 754, I encourage you to view the previous webinars published by API.

-Overview topics as listed →

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Process Safety Indicator Pyramid

Emphasis for Data Collection & Reporting

Broad Access [Nationwide] Public Reporting

Tier 1 — LOPC Events of Greater Consequence

Tier 2 — LOPC Events of Lesser Consequence

Tier 3 — Challenges to Safety Systems

Tier 4 — Operating Discipline & Management System Performance Indicators

Lagging Indicators

Leading Indicators

- Tiers 1 & 2 are RP-754 standardized definitions

- Tiers 3 & 4 are company defined performance indicators

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•If you have participated in previous webinars, this graphic may look familiar to you:

   •The pyramid itself reflects the 1931 Heinrich model which embodies two key concepts:

   •First, events can be placed on a scale of increasing consequence

   •Second, precursor or predictive events occur at a lower consequence for each event with a higher consequence

•In terms of the Chemical Safety Board recommendation

   •Tier 1 serves as a lagging indicator

   •Tier 2 serves as a leading indicator (predictive of Tier 1)

   •Tiers 3 & 4 serve as indicator for use at individual facilities [WE WILL TALK MORE ABOUT TIER 3 REGARDING RESULTS COMMUNICATION LATER IN THE PRESENTATION]

•Leading and lagging labels are often debated, but the classification is not important.

   •The important point is to capture information that can be acted upon to correct a situation.

   •Indicators at the top of the pyramid tend to be more lagging, while indicators at the bottom tend to be more leading or predictive

•Tier 4 and to some extent Tier 3 are the action end of the pyramid. It is at this level that performance is improved which in turn affects the outcome measured by Tiers 1 & 2.

Critical First Step:
· Education & Awareness on the value of metrics as they apply to Process Safety
  – You can't track what you never hear about, monitor, or see
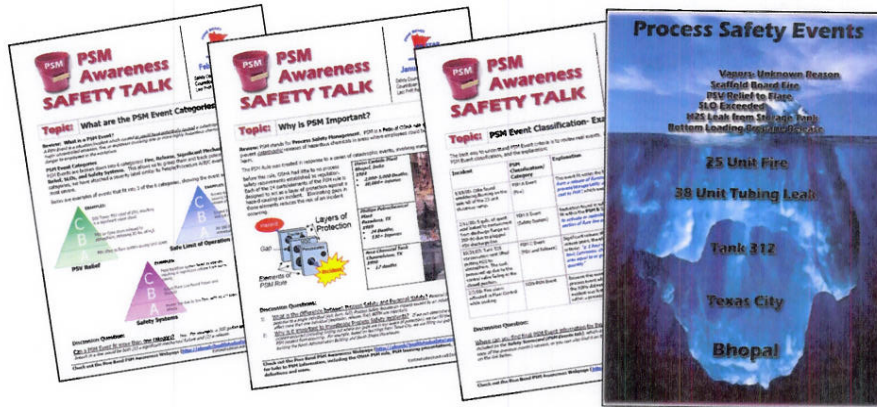
•API 754 is focused in unplanned losses of primary containment. If the connection between losses of containment and process safety are not made for employees and contractors, they may not understand the importance of reporting even minor leaks and releases.

•As you implement API 754, I would encourage you to incorporate frequent communication regarding how process safety can be improved if losses of primary containment are detected, reported, measured, and investigated.

•Since Tier 1 and 2 metrics will be reported externally, it is imperative that the metrics reflect the reality of the issues in the plant. You cannot capture those unless the facility is educated on why they are important to encourage accurate and consistent reporting.

•In the next several slides, I'll be walking you through the data collection and reporting process for Tier 1 & 2 metrics

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Process Safety Event Process Overview
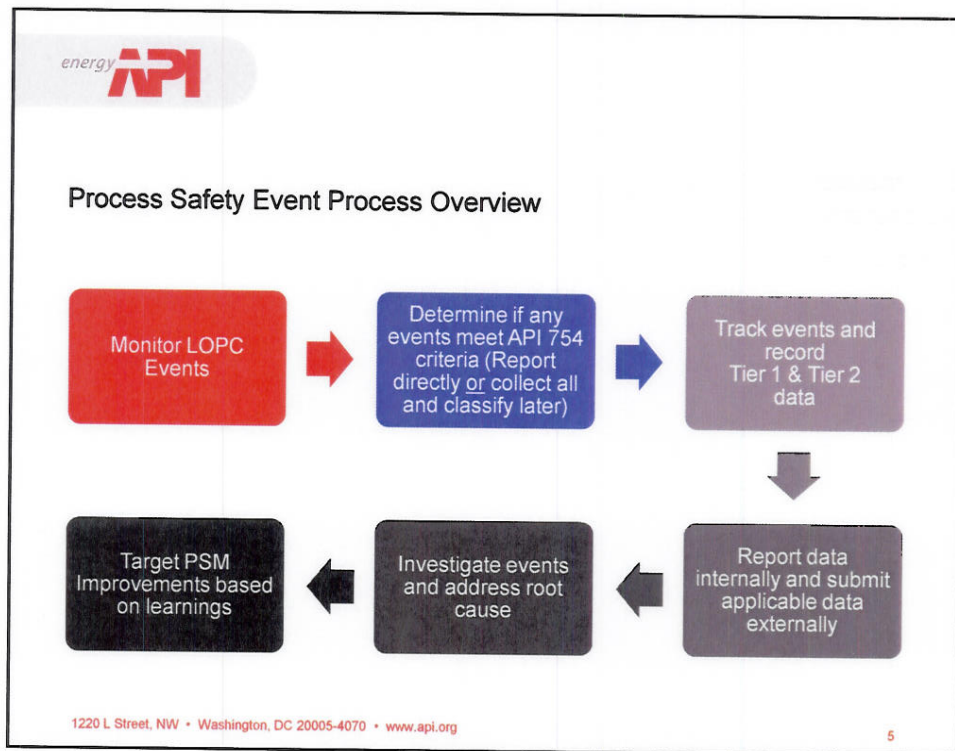
As covered in previous API 754 Webinars, a Process Safety Event (PSE) is defined as an unplanned or uncontrolled release of material, including non-toxic and non-flammable materials, from a process which results in specific consequences.

- A basic work process for event review and analysis is shown here <<animate through each box>>

  - Monitoring unplanned LOPC events, either looking specifically for LOPC events or by filtering already reported or recorded events

  - Determining if events meet API 754 Tier 1 or 2 criteria – this step could be done manually or by logic written in the facility or company's reporting system

  - Data associated with the Tier 1 or 2 event is then tracked and recorded internally for future reporting (Note that data sharing will be handled on a gradual basis as API 754 roll-out matures over the next few years)

  - An important step comes when the event is investigated according to your company's investigation requirements or standards

  - The process safety improvement step comes when the cause of the event is determined and improvement areas are identified. This step is also a great opportunity to share learnings both internally and externally to maximize the benefit of the lessons learned.
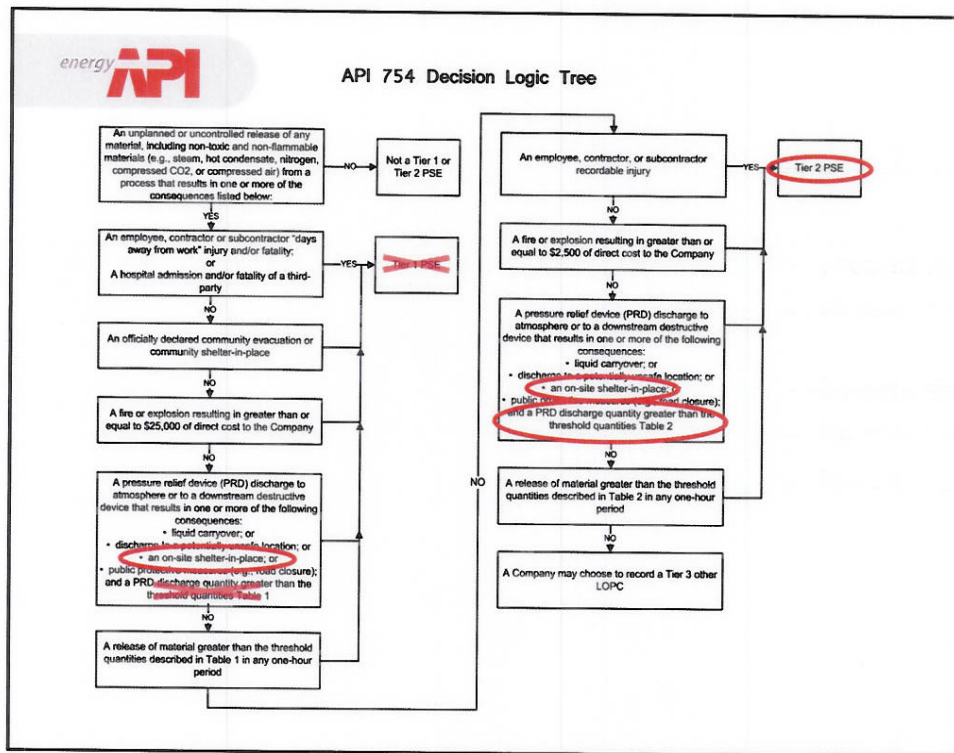
Example Event

- Process upset
- 40 lbs H_2S released through a pressure safety device (PRD/PSV) on a tank
- Release results in a shelter in place order within the facility
- No offsite impact
- Tier 2 event

The details of the example event are as follows:

-The site had a process upset which resulted in a release of 40 pounds of Hydrogen Sulfide through a pressure safety device or PSV located on a tank

-Due to the proximity of the release to nearby personnel and the potential for additional releases, the site issued a shelter in place order within the facility

-There was no offsite impact of the release

-Based on API 754 classification covered in the 2nd Webinar on Tier 1 & Tier 2 Events, this event is classified as a Tier 2 Event.

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API 754 Decision Logic Tree

An unplanned or uncontrolled release of any material, including non-toxic and non-flammable materials (e.g., steam, hot condensate, nitrogen, compressed CO2, or compressed air) from a process that results in one or more of the consequences listed below: — NO → Not a Tier 1 or Tier 2 PSE

YES ↓

An employee, contractor or subcontractor "days away from work" injury and/or fatality; or A hospital admission and/or fatality of a third-party — YES → Tier 1 PSE

NO ↓

An officially declared community evacuation or community shelter-in-place

NO ↓

A fire or explosion resulting in greater than or equal to $25,000 of direct cost to the Company

NO ↓

A pressure relief device (PRD) discharge to atmosphere or to a downstream destructive device that results in one or more of the following consequences:
• liquid carryover; or
• discharge to a potentially unsafe location; or
• an on-site shelter-in-place; or
• public protective measures (e.g., road closure); and a PRD discharge quantity greater than the threshold quantities Table 1

NO ↓

A release of material greater than the threshold quantities described in Table 1 in any one-hour period

An employee, contractor, or subcontractor recordable injury — YES → Tier 2 PSE

NO ↓

A fire or explosion resulting in greater than or equal to $2,500 of direct cost to the Company

NO ↓

A pressure relief device (PRD) discharge to atmosphere or to a downstream destructive device that results in one or more of the following consequences:
• liquid carryover; or
• discharge to a potentially unsafe location; or
• an on-site shelter-in-place; or
• public protective measures (e.g., road closure); and a PRD discharge quantity greater than the threshold quantities Table 2

NO ↓

A release of material greater than the threshold quantities described in Table 2 in any one-hour period

NO ↓

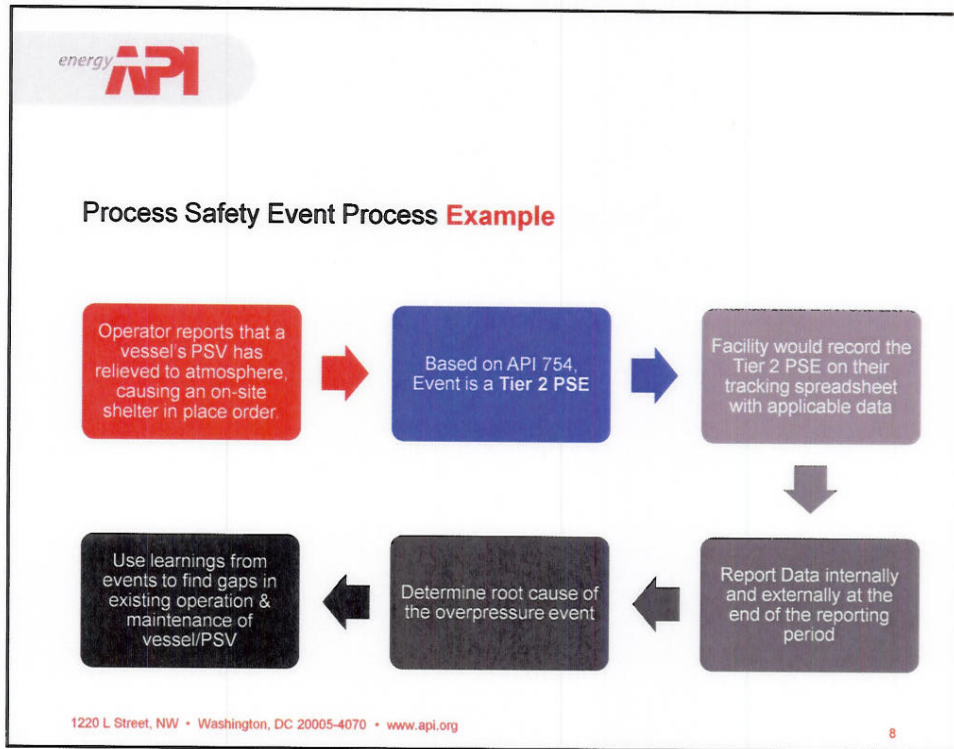A Company may choose to record a Tier 3 other LOPC

•In order to assist users of API 754 to determine if their events meet the Tier 1 and 2 PSE criteria, API 754 includes a useful flowchart that walks through the logic steps of event classification.

•I'd recommend that you use this flowchart in both your **training** of personnel classifying incidents (if applicable), and also as a basis to **audit** classifications once they are entered, especially if the classification is done automatically via scripts or macros in existing databases or data collection systems.

•To point out how it's used, I'll now walk through our earlier PSV example to show you how the flowchart confirms our PSE classification result of Tier 2.

<<Walk through flowchart via Hyperlink, using PSV example again (use animation circles & x's to show applicable boxes to arrive at final decision>>

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Process Safety Event Process **Example**

Operator reports that a vessel's PSV has relieved to atmosphere, causing an on-site shelter in place order.	→	Based on API 754, Event is a **Tier 2 PSE**	→	Facility would record the Tier 2 PSE on their tracking spreadsheet with applicable data
				↓
Use learnings from events to find gaps in existing operation & maintenance of vessel/PSV	←	Determine root cause of the overpressure event	←	Report Data internally and externally at the end of the reporting period

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Here is an example to walk through the steps we have just covered <<animate through each box>>:

•As an outcome, the facility might edit their operating procedure through their existing procedure MOC process, and then communicate with others in their site, company, or even industry depending on the significance of the learning or severity of the event.

•In order for users of API 754 to drive process safety performance improvement, data must be captured accurately and consistently. This will allow data to be analyzed, compared and utilized in benchmarking studies- all going back to consistent definitions/basis.

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PSE Data Capture

Site Information

- Type of Facility (NAICS or equivalent international code)
- Corporate Name and Company Name (if different)
- Site Location/Name (country, state/province, city, site name)
- Site Identifier (unique number assigned by data collection group)
- Total work hours

Tier 1 or 2 PSE Information

- Site Identifier
- Identification of Tier 1 or 2 PSE Consequences / Triggers
  - Harm to people
  - An officially declared community evacuation or community shelter-in-place
  - A fire or explosion
  - A pressure relief device discharge to atmosphere whether directly or via a downstream destructive device
  - An acute release of flammable, toxic or corrosive chemicals

The purposes of required data capture and reporting include:

- Each event is an opportunity for learning and improvement

- Cumulative data provides for analysis and benchmarking of performance

- Reporting of PSE data to industry associations can trigger to focus of industry resources to address common issues.

Basic information is to be captured and reported for each Tier 1 & 2 event.

PSE Related Information

- Type of Process
- Date & Time of Event
- Mode of Operation
- Point of Release
- Type of Material Released

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Additional information to be captured and reported for Tier 1 and 2 events includes:

<<Read from slides.>>

This information will help at an industry level in determining where joint efforts should be targeted to reduce incident frequency.

The following slides cover an example data reporting format.

API 754 Sample Tier 1 & 2 Data Reporting Format

- Data collection may be done a number of different ways
- A sample spreadsheet has been prepared to show data to be collected on Process Safety Events (PSEs)
- Spreadsheet includes:
  - Introduction/Instruction Tab
  - Site Data Tab
  - Event Recordkeeping Tab
  - Reference Tables Tab
  - Pick list Tab

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•Facilities implementing API 754 are coming from a number of different starting places concerning existing event data colleciton systems. Because of this, I'll emphasize that there are number of different ways that data can be collected.

•Today I am covering a very basic spreadsheet method for data recordkeeping. Your facility/company may have an existing system that can export the same data, making a separate spreadsheet unnecessary. Use of this spreadsheet is not required, although collecting the data included in the spreadsheet is. The required data is also specifically referred to in API 754.

•I'll be walking through the spreadsheet next to help you understand what is there and why.

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Site Data Tab

· One line of data would be entered on the Site Data tab of the spreadsheet for each facility reporting data.

NOTE: Each Site is a row of data

Corporate Name	Company Name	Company Code	Site Name	Site Code	Site ID	Country	State/ Province
		Chosen by API-Stats		Chosen by Company	Chosen by API-Stats		optional
Corporation ABC	ABC-Refining Division	1	NewCo Refinery	XXX-XXX	XXXXX	USA	TX
NewEnergy Co.	NewEnergy Refining	366	XYZ Refinery	001-600	12485	USA	MN

•The Site Data Tab contains basic information about the site where the LOPC data was generated from

•The spreadsheet is designed to only require one line of data to be completed for the site associated with the data.

•Now I'll walk through the specific data included. Note that the 1st data line (noted with gray shading) is an example that is contained in the spreadsheet, while the 2nd data line is meant to show what a real facility would be entering.

•Basic site data comes first, including the corporation name, company name, a company code (chosen by API), followed by the site name & site code, which is selected by the company). The Site ID is a code chosen by API for their records. Next you'll input the country and state or province where the site is located.

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Site Data Tab

i c s			Normalizers				Normal
City	Facility Type	Facility Type	Employees' Hours	Contractors' Hours	Refining Capacity	Refining EDC	Normalizer spare 1
optional	NAICS or Equivalent	refining/gas plant/other			BPD		
Rosemount	324110	Refinery	1,960,970	1,727,780	280,000		

•Continuing to the right on the spreasheet, you have the option to include the city, followed by the facility type (using the North American Industry Classification System or NAICS or equivalent system) and facility type description, such as refinery or gas plant.

•Next, normalizers are included. The normalizers will be used when site data is combined for industry benchmarking purposes. Normalizers include employee hours and contractor work hours, further defined in Section 3.1 (Definitions) and Section 10 (Reporting) of API 754. Also included on the spreadsheet are Refining Capacity in barrels per day and Refining EDC (Equivalent Distillation Capacity). There are also columns to include other formalizers if appropriate.

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Site Data Tab

lizers		Additional Information				
Normalizer spare 2	Normalizer spare 3	Reporting Year	Submitting data to other groups?	Which Groups?	Basis of data this year	
		Year of the data			API754, CCPS, API 2008ed.	
		2010	Yes	NPRA, API	API 754	

Further to the right, in the additional information section, each site would input

-the reporting year for the data included,

-Whether or not they are reporting the data to other groups

-Who they are reporting to, such as NPRA (National Petrochemical & Refiners' Association) or CCPS (Center for chemical process safety)

-The reporting basis for the data is included, such as API 754 or the CCPS criteria.

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Site Data Tab

	Additional Information					
History	Operated Full Year?	Included last Year?	Opened/ Closed?	Change of ownership?		
Owned since 1969	Yes	No	N/A	No		

The last section of Site data includes:

•The age of the site, then whether or not the site was

   •Operated the full year

   •Included in the metrics during the previous year

   •Currently open or closed

•And Lastly, if a change in ownership has occurred during the reporting period

Event Data Tab

One line of data would be entered on the **Event** Data tab of the spreadsheet for each Process Safety Event that meets the Tier 1 or Tier 2 criteria.

•The Event Data Tab contains the detailed Process Safety Event information that meet Tier 1 or Tier 2 criteria.

•Again, this spreadsheet shows what the required data includes, though this specific spreadsheet is not required as a means to submit the data.

•Each participating facility will be required to record this data for each of their Tier 1 or Tier 2 PSEs (one data line per event)

•Now I'll walk through the specific data included, using our earlier example of a PSV release. Note that the 1st data line (in gray) is an example that is contained in the spreadsheet, while the 2nd data line is meant to show what an actual facility would be entering.

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Event Data Tab

Site Code	Date	Time	Type of process	Mode of operation	Point of release	Type of material
NOTE: Please list each Event on a separate row.						
Chosen by Company	mm/dd/yyyy	24-hour	drop-down list for each type of facility - for refining see # 1 below)	drop-down list # 2 (see below)	drop-down list # 3 (see below)	drop-down list # 4 (see below)
Ex. [001-001]	1/2/2009	04:50	Hydrogen	Normal	Heat exchanger	Flammable
001-001	2/20/2010	16:25	Tank farm/offsites	Upset	Flare/relief system	Toxic

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•On the Events tab of the spreadsheet, the site would enter the following information for this event:

•Site code (chosen by the company)

•The Date and time of the event

•The type of process where the Loss of Primary Containment occurred; Note that the options for this and other columns are included in a drop down list in the spreadsheet. The options are also listed in Section 10.4.4 of API 754 if a company is not using the spreadsheet for data recording.

•Next, the mode of operation during the event- in this case an upset condition.

•The point of release is the equipment type where the Loss of Primary Containment was released from- in this case a relief system or PSV

•The type of material released is listed as one of several general categories-again, selected from the list included in Section 10.4.4.- in this case Toxic for H2S

•The required information continues on the next slide (further to the right on the same spreadsheet)

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Event Data Tab

<OPTIONAL> short description [100 character limit]	<OPTIONAL> free text provided for including useful justification, details, questions on interpretation, etc	An unplanned or uncontrolled release nontoxic and nonflammable materials nitrogen, or compressed air) from a p more of the consequeno	Injuries			
			Enter number of inj			
			employee fatalities T1-1.ii	employee days away fro work cases T1-1.i	contractor fatalities T1-1.iv	contractor days away fro work cases T1-1.iii
Fire on exchanger in hydrogen plant that led to an emergency trip.	Unplanned LOPC causing fire with >$2500 but less than		0	0	0	0
Process upset caused H2S plume from PSV- inducing in-plant shelter in place order.	Unplanned release of toxic material through pressure relief device; Cause Shelter in place in plant, but less than Tier 1 Threshold Quantity		0	0	0	0

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It is optional to include a short description of the even, and also optional to include a basis or justification for the classification of the event (in this case Tier 2)

The next section captures injury consequences of the event.

•Each injury column is defaulted to zero. Since no injuries for either employees or contractors were involved in this incident, all injury columns remain at zero.

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Event Data Tab

Injuries				Evac?	Fire / Explosion		(PRD)
uries that result in:				Yes/No	Yes/No-Direct Cost		
third party fatalities	third party hospital admissions	employee recordable injuries	contractor recordable injuries	officially declared community evacuation	fire - direct cost	explosion - direct cost	PRD directly to atmosphere or via downstream destructive device
T1-2.ii	T1-2.i	T2-1.i	T2-1.ii	T1-3	T1-4.i / T2-2.i	T1-4.ii / T2-2.ii	T1-5.a.i / T2-3.a.i
0	0	0	0	No	Yes - $2500 to $25,000 direct cost damage	None	Not Applicable
0	0	0	0	No	None	None	Table 2 volume 'to atmosphere' from Malfunctioning PRD

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The next section covers evacuation. Since no officially declared community evacaution was involved, this column remains with a 'No' entry.

In the Fire/Explosion section, the direct cost of the fire or explosion is recorded. Since there was no fire, this is left at 'None'

The following section covers pressure relief devices or PRDs, which is applicable to the example event.

The first column of this section asks if a PRD relieved directly to atmosphere or via a downstream destructive device. This is true- and the volume was a Tier 2 volume (as shown in Table 2) and went to atmosphere, thus it is recorded as shown.

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Event Data Tab

| Malfunctioning PRD discharge | | | | An acute r... | | |
| Exceed Table 1 [Tier 2 - Table 2] | | | | | | |
contains liquid carryover	discharge to unsafe location	on-site shelter-in-place	public protective measure	acute release - category 1	acute release - category 2	acute release - category 3
T1-5.b.i / T2-3.b.i	T1-5.b.ii / T2-3.b.ii	T1-5.b.iii / T2-3.b.iii	T1-5.b.iv / T2-3.b.iv	T1-6.i / T2-4.i	T1-6.ii / T2-4.ii	T1-6.iii / T2-4.iii
Not Applicable	Not Applicable	Not Applicable	Not Applicable	No	No	No
Not Applicable	Not Applicable	Table 2 volume 'to atmosphere' from Malfunctioning PRD	Not Applicable	No	Yes - Tier 2 level	No

As we continue through the PRD discharge section, the applicable sections are made:

-There was no liquid carry over, no discharge to an unsafe location, and no public protective measures were required

-However- there was an onsite shelter in place order, so this is recorded in the appropriate column

Next, we move to the Acute Release section.

- Because Hydrogen Sulfide or H2S is considered a toxic substance, it is recorded as an Acute Release Threshold Category 2 release (TIH Zone B). Refer to the Webinar on Tier 1 & Tier 2 for more information about release classification. **The example event is listed as Tier 2 level because the amount (40 pounds) was less than the Tier 1 quantity of 55 pounds, but greater than the Tier 2 quantity of 5.5 pounds.**

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Event Data Tab

...ntainment

acute release - category 6	acute release - category 7	Indoor or Outdoor Release?	API 754 Resulting Classification and Event Type	
T1-6.vi / T2-4.vi	T1-6.vii / T2-4.vii		Tier	Type (Optional)
No	No	Outdoor	Tier 2	Fire
No	No	Outdoor	Tier 2	PRD Discharge

After placing the release in the appropriate category, the site must also note whether it was an indoor or outdoor release.

Lastly, each event is summarized with a Tier 1 or Tier 2 Classification and an optional Event Type, such as PRD Discharge, Acute Release, or Injury. In the case where multiple categories apply, the most severe should be recorded.

For example, if a Tier 2 release causes a lost time injury or hospitalization, the type should be listed as Injury. Again, this last field is optional, but helpful when summarizing information.

For this example, the release quantity was in Tier 2, and it was classified as a PRD Discharge since the release came out of a PRD and there was an onsite shelter in place order as a result.

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References

- It is useful to create a common list of substances involved at your facility that could be released

- Include the Threshold Release Category (i.e. TIH Zone), Threshold and Quantity

Classification	Tier 1 – Higher consequence		Tier 2 – Lower consequence	
Acute Release [Meets threshold quantity during any one-hour duration]	**Threshold quantities:**		**Threshold quantities:** (Approx. 10% of UNDGL Threshold Quantity)	
	Flammable Gas (flashpoint < 73 °F, boiling point < 95 °F)	1100 lbs	Flammable Gas (flashpoint < 73 °F, boiling point < 95 °F)	100 lbs
	Flammable Liquid UNDGL PG II (flashpoint < 73 °F, boiling point > 95 °F)	7 bbls	Flammable Liquid UNDGL PG II (flashpoint < 73 °F, boiling point > 95 °F)	1 bbl
	Flammable Liquid UNDGL PG III (flashpoint ≥ 73 °F and ≤ 140 °F) or Combustible Liquid (flashpoint > 140 °F) released above flashpoint	14 bbls	Flammable Liquid UNDGL PG III (flashpoint ≥ 73 °F and ≤ 140 °F) or Combustible Liquid (flashpoint > 140 °F) released above flashpoint	1 bbl
	Toxic Substances (See UNDG list for full list): Ammonia, Anhydrous TIH D - 440 lbs Ammonia, Aqueous (10-35% solution) PG III - 4400 lbs Chlorine TIH B - 55 lbs Hydrogen Sulfide TIH B - 55 lbs Hydrogen Fluoride, Anhydrous TIH C - 220 lbs Hydrofluoric Acid, > 60% solution PG I - 1100 lbs Hydrofluoric Acid, < 60% solution PG II - 2200 lbs Sodium Hydroxide (caustic - fresh) PG II - 2200 lbs (124 gallons) Sodium Hydroxide (caustic - spent) PG II - 2200 lbs (220 gallons) Sulfuric Acid (spent and fresh) PG II - 2200 lbs (144 gallons) Sulfur Dioxide TIH C - 220 lbs	Various (see detail)	**Toxic Substances** (See UNDG list for full list): Ammonia, Anhydrous TIH D - 5 lbs Ammonia, Aqueous (10-35% solution) PG III - 220 lbs Chlorine TIH B - 5 lbs Hydrogen Sulfide TIH B - 5 lbs Hydrogen Fluoride, Anhydrous TIH C - 5 lbs Hydrofluoric Acid, > 60% solution PG I - 100 lbs Hydrofluoric Acid, < 60% solution PG II - 220 lbs Sodium Hydroxide (caustic - fresh) PG II - 220 lbs (12 gallons) Sodium Hydroxide (caustic - spent) PG II - 220 lbs (22 gallons) Sulfuric Acid (spent and fresh) PG II - 220 lbs (14 gallons) Sulfur Dioxide TIH C - 5 lbs	Various (see detail)
	Strong acids or bases (pH < 1 and > 12.5) *not otherwise classified	14 bbls	Moderate acids or bases (pH < 1 and > 12.5) *not otherwise classified Combustible Liquid (flashpoint > 140 °F) released below flashpoint	10 bbls

•In addition to the flowchart, it is useful for facilities to compile references for API 754 that are specific to their facility or type of operation.

•This example shown is a reference table for Tier 1 and Tier 2 releases in a refinery operation. Note that the list of toxic substances includes only those that the facility has on site, for ease of use by those classifying events.

•This example would be most useful to those working to implement API 754 for several sites (common group to multiple facilities), assuming they are knowledgeable on the classification categories.

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References

- Another example of a release threshold table (site-specific):

Example Release Thresholds for Refining Process Safety Events

Acute Release = Exceeds threshold in <=1 hour		Tier I			Tier 2 (10%)		
Chemical Name	Hazard Classification	Threshold (lb)	Barrels	Gallons	Threshold (lb)	Barrels	Gallons
#1 Fuel Oil	Combustible Liquid	4400	14.99	629	440	1.50	63
#2 Fuel Oil	Combustible Liquid	4400	14.06	591	440	1.41	59
Anhydrous ammonia	Toxic Inhalation Hazard	440	2.03	85	44	0.20	9
Butane	Flammable Gas	1100			110		
Chlorine	Toxic Inhalation Hazard	55			5.5		
Clarified Oil	Combustible Liquid	4400	11.37	478	440	1.14	48
Crude Oil	Flammable Liquid	2200	6.90	290	220	0.69	29
FRC Gasoline	Flammable Liquid	2200	8.28	348	220	0.83	35
Gas Oil	Combustible Liquid	4400	13.88	583	440	1.39	58
Heavy Alkylate	Flammable Liquid	2200	8.95	376	220	0.90	38
Heavy Cycle Oil	Combustible Liquid	4400	11.37	478	440	1.14	48
Heavy Vacuum Gas Oil	Combustible Liquid	4400	13.28	558	440	1.33	56
Hydrogen	Flammable Gas	1100			110		
Hydrogen Sulfide	Toxic Inhalation Hazard	55			5.5		
Light Coker Gas Oil	Flammable Liquid	2200	7.16	301	220	0.72	30
Light Cycle Oil	Combustible Liquid	4400	12.55	527	440	1.25	53
Light Vacuum Gas Oil	Combustible Liquid	4400	13.69	575	440	1.37	58
MDEA	Combustible Liquid	4400	12.56	528	440	1.26	53
MEA	Combustible Liquid	4400	12.56	528	440	1.26	53
Propane	Flammable Gas	1100			110		
Sulfur Dioxide	Toxic Inhalation Hazard	220			22		

•This table is a simple list of common streams for a specific site, and includes their Tier 1 and Tier 2 threshold

•This table shows an example of a customized materials list for one site, wihich could easily be used by a Maintenance or Operations employee or Front Line Supervisor.

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Examples Section of API 754

- Annex A contains multiple examples of events and their correct classification using API 754

- Annex A is organized by event type, and includes a determination for each example of what the resulting classification would be based on the event described

Loss of Primary Containment (LOPC)	19) An operator opens a quality control sample point to collect a routine sample of product and material splashes on him. The operator runs to a safety shower leaving the sample point open and a Tier 2 threshold quantity is released. This is a Tier 2 PSE since the release of a threshold quantity was unplanned or uncontrolled.	Tier 2 §6.2, Tier 2 Definition
	Same as above, however, the operator catches the sample, blocks in the sample point and later drops and breaks the sample container resulting in exposure and injury from the sample contents. This is not a PSE because the LOPC is from a piece of ancillary equipment not connected to a process.	Not a PSE §1.2, Applicability
	20) A bleeder valve is left open after a plant turnaround. On start-up, an estimated 15 bbl of fuel oil, a liquid with a flashpoint above 60 °C (140 °F), is released at 38 °C (100 °F) (below its flashpoint) onto the ground within an hour and into the plant's drainage system before the bleeder is found and closed. This is a Tier 2 PSE.	Tier 2 §6.2, Table 2
	Same as above, except the release temperature is above the flashpoint; thus, it would be a Tier 1 PSE.	Tier 1 §5.1, Table 1

- A useful list of examples, organized by category (such as injury, loss of primary containment, and pressure relief devices), is included in Annex A.

- The Annex includes over 50 detailed examples.

- The last column contains the correct classification of the situation (i.e. Tier 2), along with a reference to the section of API 754 used to make the determination.
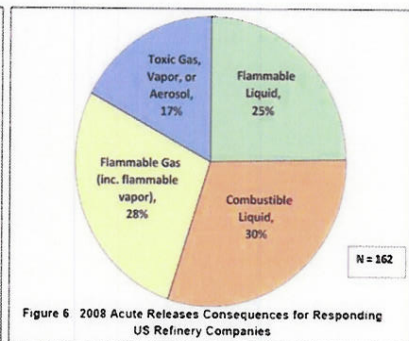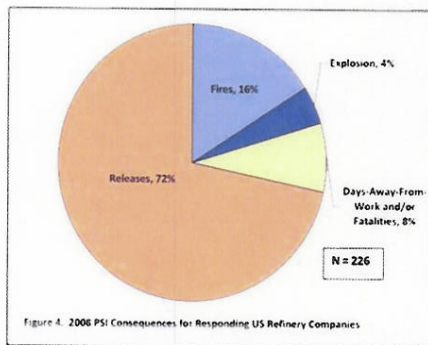
- TRANSITION TO NEXT SLIDE

Extending API 754 Data into Industry, Company & Site Analysis

- It is a natural extension of API 754 data collection to develop trends, breakdowns, and pareto charts by industry-type, company and by site

- The following slides contain examples of what can be done with API 754 data once it is collected.

•I'll now walk through some examples that show what could be voluntarily done by a company or site with the API 754 data to determine specific process safety areas that require improvement.

•TRANSITION TO NEXT SLIDE

Examples of Industry Data Analysis

Figure 4. 2008 PSI Consequences for Responding US Refinery Companies

Figure 6. 2008 Acute Releases Consequences for Responding US Refinery Companies

- API has been collecting petrochemical industry data with somewhat similar criteria to Tier 1 PSEs for several years.

- This is an example of analysis that is possible when data is reported in using clear criteria on process safety events.

- Note that the 2nd pie chart is a breakdown of the releases in refineries by type of material released.

- This data can be used to better target proactive efforts on an industry, company, and site level.

- For example, the data on the right pie chart shows us that the majority of the releases in refineries in 2008 occurred in liquid form and were not toxic materials.

- TRANSITION TO NEXT SLIDE

Data Analysis Examples:
Single Site

Safety System 57%
PSV Relief 19%
Safe Limit 9%
Fire 9%
Release 6%
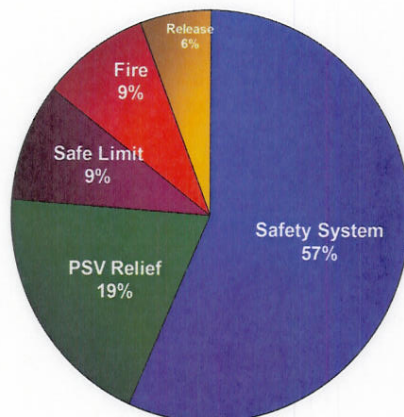
• When analyzing API 754 data on a site level, the site may also choose to track Tier 3 data, similar to Tier 1 & 2 as covered earlier in this presentation.

• This data allows the site to determine what types of process safety events are occurring most often within a certain time frame [this example was for a 1 year period]

• In this case, challenges to safety systems (such as heater trips) were the leading type of Tier 3 process safety events

• TRANSITION TO NEXT SLIDE

Data Analysis Examples:
Multi Site
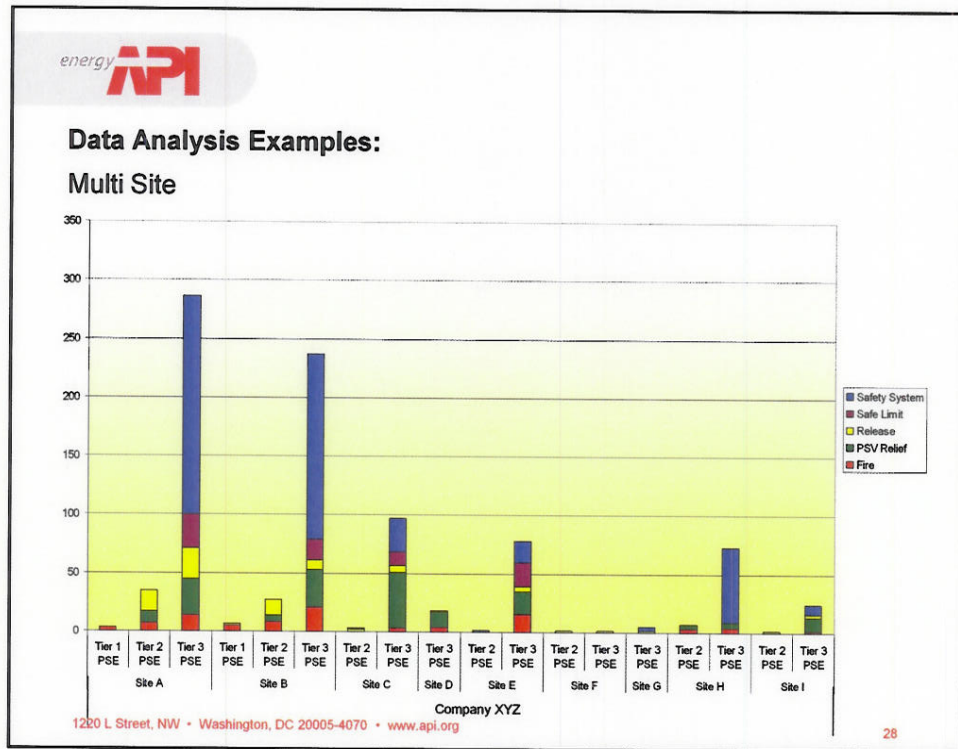
•This chart shows an example of how Tier 1, 2, and 3 data could be used to compare performance within a company at various sites.

•The colors represent various types of PSE, while the columns show the severity and count of events (Tier 1-3).

•This data can be very useful when analyzing PSEs to look for trends and differences among sites.

•For example, this chart would tell you that the 2 sites with the largest amount of events were struggled most with safety system challenges (Tier 3), but also had fires as their most prevalent type of Tier 1 event.

•TRANSITION TO NEXT SLIDE
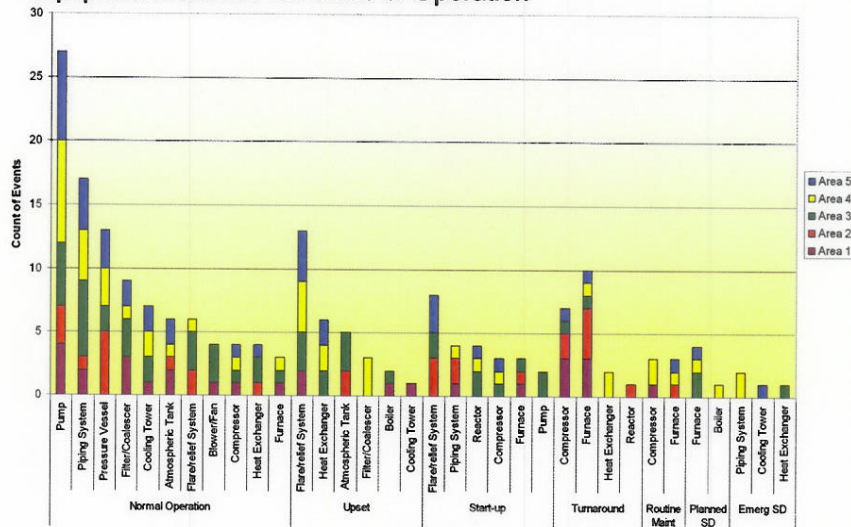
•This slide shows an example of how PSE data collected can be analyzed within a site. There are many potential ways to slice & dice this data- including by LOPC-type, severity of impact, time/month, etc.

•For example, this analysis shows that most events at this site occur during normal operations, and of those, most incidents involve pumps- which are spread among all 5 areas of the facility.

•This type of analysis is helpful to pinpoint improvement areas on a broad basis for a site or company, rather than only looking at a specific event or list.

•TRANSITION TO NEXT SLIDE

"What's in it for me?"

· Classification and communication of facility events as Process Safety Events is a powerful catalyst for Process Safety awareness

· Data collected on events can be used to:
- Draw attention to areas of process safety that employees are not aware of
- Focus in-depth investigations on specific 'repeat offenders'
- Pareto the highest frequency of events to better allocate resources and equipment
- Assist with prioritizing project resources for equipment improvements
- Categorization and prioritization of events is an excellent learning tool for facility personnel on critical areas of process safety
- Trigger actions which become a 'what have I done for you lately' list of specific process safety improvements
- Show improvement over time, which should be communicated both internally and externally

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• After data collection and categorization is complete, API 754 results have many benefits for participating sites.

• Read through points listed, including examples such as

> • Priority of a safety system challenge vs. a PSV relief with liquid carry over as far as level of investigation and management review required sends a clear message to an organization about what Management and Safety consider important and worthy of more analysis

> • Also, simply requiring basic investigations of Tier 3 PSEs would send a message that they are expected to be minimized- such as PSV overpressures to a flare system with no carry over

• Analysis of events can be extremely helpful when prioritizing equipment improvement projects for the coming year

• Data from events are also useful during PHAs, since Tier 2 or 3 data may include incidents that previously were not considered or investigated, yet provide useful Process safety learnings.

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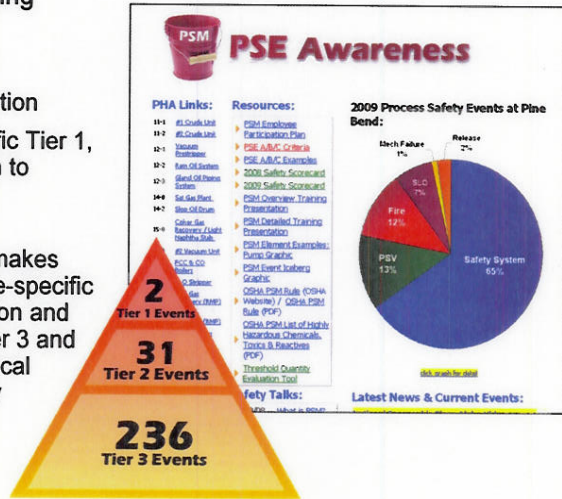
•Speak to contents of the slide

•Transparency is valued by our employees and communities

•Internal reporting can be handled using a simple one-page website available to all employees and contractors as well as other measures communications the facility already has in place for other safety measures

• Local community reporting could be accomplished in an annual face to face discussion with a community advisory council if a facility has one, explaining the basis for Tier 1 and 2 API 754 classification, as well as the local site's results. Over time, changes since the initial years data were collected can be very useful for comparison purposes.

•Exemption: Unattended, remote-operated, or single-manned facilities are exempt.

•Exemption: Remote sites where the worst potential-case LOPC cannot impact any public receptors are exempt.

•TRANSITION TO NEXT SLIDE

energy API

Where to go for Help

- **API website**: http://api.org/standards/psstandards
  - Access to API 754 Recommended Practice
  - Sample Data Spreadsheet
  - Webinar Presentations
  - Contact Information for API personnel if questions arise
  - Benchmark information for member companies who participate in data collection
- **CCPS website** : http://www.aiche.org/ccps/
  - Full list of materials cross-referenced to the UN Dangerous Goods definitions
  - Guidelines for Process Safety Metrics: http://www.wiley.com/WileyCDA/WileyTitle/productCd-0470572124.html
- **NPRA website**: http://www.npra.org/
  - Many resources for member companies
- **DOT Resources:**
  - Hazardous Materials Table (§ 172.101)
    http://ecfr.gpoaccess.gov/cgi/t/text/textidx?c=ecfr&rgn=div8&view=text&node=49:2.1.1.3.7.2.25.1&idno=49

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- Several resources are available for those using API 754
- Walk through content on slide

- TRANSITION TO NEXT SLIDE

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Electronic Download of RP-754

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As I said at the beginning, all four webinars are being recorded for future playback on the API website.

If you have any questions or comments beyond today's webinar, Karen Haase is the API Staff member tagged to RP-754.

Her contact information is shown on the screen.

Also, RP-754 is available for free electronic download at the URL shown.

Okay, let's open it up for questions.

•Following any questions, TRANSITION TO NEXT SLIDE