High Consequence Areas

Industry Presentation
March 14, 2003
Outline of Presentation

• Describe Industry Work in Defining HCAs
• Discussion of January 28, 2003, Integrity Management for Natural Gas Pipelines NPRM (HCA Focus)
• Discuss Intent of HCA Definitions
• Discuss Proposed Industry Definition
  – Scientific Basis
  – Proposed Language
• Compare and Contrast OPS/Industry Approaches
How to Define HCA's?

- INGAA began work to determine a valid technical basis in 1999
- Led to Pure Technical Approach ("C-FER Circle")
- Empirical Model Validated With Real Data
- Led to INGAA / AGA Proposed Definition in 2000
- OPS Adopted C-FER Methodology in NPRM
Model Validation – North American Incidents

- TSB-P95H0036 (42@880)
- TSB-P94H0036 (36@1000)
- TSB-P94H0003 (42@1207)
- NTSB-PAR-95-1 (36@970)
- NTSB-PAR-87-1 (30@987)
- NTSB-PAR-87-1 (30@987)
- NTSB-PAR-86-1 (30@1016)
- NTSB-PAR-83-2 (20@820)
- NTSB-PAR-77-1 (20@785)
- NTSB-PAR-75-3 (12@497)
- NTSB-PAR-75-2 (30@718)
- NTSB-PAR-71-1 (14@785)

- Proposed HCA radius
- Maximum offset to burn extent
- Equivalent radius of burn area
- Maximum offset to injury
- Maximum offset to fatality

Distance (ft)
192.761 Definitions
The following definitions apply to this section and 192.763:

**High consequence area** means any of the following areas:

(a) A potential impact zone which contains 20 or more structures intended for human occupancy or an identified site,

(b) An **identified site** is:
(1) A building occupied by 50 or more persons 5 days a week 10 weeks a year (the days and weeks need not be consecutive), or
(2) A small, well defined outside area occupied by 20 or more persons 5 days a week 10 weeks a year (the days and weeks need not be consecutive), and
(i) Is visibly marked;
(ii) Is licensed or registered by a Federal, State, or local agency;
(iii) Is known by public safety officials; or
(iv) Is on a list or map maintained by or available from a Federal, State, or local agency.

A **potential impact zone (PIZ)** is defined as that circular area within the PIR distance of the pipeline.

A **potential impact radius (PIR)** is defined as the radius of a circle within which the potential failure of a pipeline could have significant impact on people or property. PIR is determined by the formula \( r = 0.685 \times \sqrt{p \times d^2} \), where “\( r \)” is the radius of a circular area surrounding the point of failure (ft), “\( p \)” is the maximum allowable operating pressure (MAOP) in the pipeline segment (psi) and “\( d \)” is the diameter of the pipeline (inches). **Note:** 0.685 is the factor for natural gas. This number will vary for other gases depending upon their heat of combustion. An operator transporting gas other than natural gas must use Section 3.2 of ASME/ANSI B31.8S to calculate the impact radius formula.
Flowchart for Pure Technical Approach ("C-FER" Circle)

1. Start
2. Determine PIR
3. Apply PIR to entire pipeline
4. 20 or more SIHO's or an identified site within PIR?
   - Yes → HCA
   - No → No HCA
NPRM HCA Definition of January 28, 2003

- Not technically based
- Extremely complex with many variables (Complexity)
- Many conflicting and inconsistent solutions (Inconsistency)
- Extremely burdensome for low pressure systems
- Small impact of low pressure/small diameter systems is not recognized
NPRM HCA Definition of January 28, 2003 (cont)

• Data on houses not readily available outside the existing 660 foot corridor (Data)
• Language is inconsistent with other language in 192
• Proposed HCA definition is inconsistent with liquid rule on 1000 persons per square mile
• Impaired mobility is not sufficiently defined
• Operator compliance will be extremely difficult, and in some instances impossible to demonstrate
NPRM HCA Definition of January 28, 2003 (Not Technically Based)

• The 15% addition to the C-FER equation is arbitrary and not based on science
• The threshold radius is arbitrary and not based on science
• The use of class locations is not the best scientific solution available today
• The use of "20 or more buildings" only for PIC's greater than 1000 foot radius is not based on science
INGAA / AGA Agrees With OPS On “20 or More Buildings”

• NPRM states for pipelines with PIR > 1,000 feet operator is to examine PIC for 20 houses
• The existing Hazardous Liquid HCA definition utilizes 20 houses, based on 1,000 people/sq mile
Pipeline diameter “d” (inches) = 36”
MAOP 1650 psig: PIR = 1000 ft

Pipeline diameter “d” (inches) = 30”
MAOP 1000 psig: PIR = 655 ft

Pipeline diameter “d” (inches) = 18”
MAOP 600 psig: PIR = 304 ft

\[ PIR = 0.69 \sqrt{pd^2} \]

20 houses within circle
NPRM HCA Definition of January 28, 2003 (Complexity)

192.761 A1 Class 3 with 46 or more houses
   A2 Class 3 with building or small well defined outside area with
       20 or more persons in at least 5 days per week, 10 weeks
       per year
   B Class 4 area
   C Identified sites for pipes not more than 12 inches in diameter
       and not more than 1000 psig operating pressure
   D Identified sites for pipes greater than 30 inches in diameter
       and greater than 1000 psig operating pressure
   E Identified sites for pipes not in C or D
   G 20 or more buildings intended for human for pipes with a
       threshold radius of 1000 feet or greater

Note: F defines an identified site.

Additional complications arise when determining moderate risk areas, and
applying the definitions of PIC, PIR, PIZ and threshold radius.
NPRM HCA Definition of January 28, 2003 (Complexity) (cont)

- A1 and B
- A2 and C
- D
- E
- G

- Pipeline
- PIR + 15%
- 1000 feet
- 660 feet
- 300 feet
NPRM HCA Definition of January 28, 2003

NPRM Flowchart

Wednesday, March 12, 2003

Site within Corridor?

No

HCA

Does the site have evidence of use by at least 20+ persons (concurrent) more than 50 days in 12 mo. period?

HCA

Is the location occupied by persons who are confined, of impaired mobility, or difficult to evacuate?

No

HCA

Is the site visibly marked?

Yes

Is the site licensed or registered by a Federal, State, or local agency?

No

Is the site known by public officials?

Yes

Is the site on a list or map maintained by or available from a Federal, State, or local agency, or a publicly or commercially available database?

Yes

No

HCA

No

Yes

HCA

Yes

Site within Corridor?

No

HCA

Facility hard to evacuate?

No

Yes

HCA

Facility hard to evacuate?

No

Yes

HCA

Facility hard to evacuate?

No

Yes

HCA

Place where people congregate?

No

Yes

HCA

Place where people congregate?

No

Yes

HCA

Place where people congregate?

No

Yes

HCA

Place where people congregate?

No

Yes

HCA

Facility hard to evacuate?

No

Yes

HCA

Facility hard to evacuate?

No

Yes

HCA

Facility hard to evacuate?

No

Yes

HCA

Facility hard to evacuate?

No

Yes

HCA

Facility hard to evacuate?
**NPRM HCA Definition of January 28, 2003 (Inconsistency)**

<table>
<thead>
<tr>
<th>Pipeline</th>
<th>30 Inch Diameter Pipeline at 1050 psig (PIR = 671 ft.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1000 feet</td>
<td>Single Licensed Day Care With 3 Persons Is an HCA</td>
</tr>
<tr>
<td>660 feet</td>
<td>Office Building with 50 Persons Is Not an HCA</td>
</tr>
<tr>
<td>300 feet</td>
<td></td>
</tr>
</tbody>
</table>
NPRM HCA Definition of January 28, 2003 (Inconsistency) (cont)

<table>
<thead>
<tr>
<th>20 houses within 1000 feet</th>
<th>35 houses within 660 feet</th>
</tr>
</thead>
<tbody>
<tr>
<td>Is an HCA</td>
<td>Is not an HCA</td>
</tr>
</tbody>
</table>

PIR + 15%

1000 feet

660 feet

300 feet

Class 2 at 1050 psig

Class 2 at 1000 psig

Pipeline

30 Inch Diameter Pipeline at 1050 / 1000 psig (PIR = 671 / 655 ft.)
NPRM HCA Definition of January 28, 2003 (Inconsistency) (cont)

20 houses within 1000 feet Is an HCA

1000 feet

660 feet

Building of 50 Persons Is Not an HCA

300 feet

Pipeline

30 Inch Diameter Pipeline at 1050 psig (PIR = 671 ft.)
**NPRM HCA Definition of January 28, 2003 (Inconsistency) (cont)**

<table>
<thead>
<tr>
<th>PIR + 15%</th>
</tr>
</thead>
<tbody>
<tr>
<td>1000 feet</td>
</tr>
</tbody>
</table>

Houses are equally spaced in each area

<table>
<thead>
<tr>
<th>30 Inch Diameter Pipeline at 1000 psig (PIR = 655 ft.)</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>660 feet</th>
</tr>
</thead>
</table>

Class 3 with 46 houses
Is an HCA

<table>
<thead>
<tr>
<th>300 feet</th>
</tr>
</thead>
</table>

Class 2 with 45 houses
Is Not an HCA

<table>
<thead>
<tr>
<th>Pipeline</th>
</tr>
</thead>
</table>

- Class 3 with 46 houses is an HCA.
- Class 2 with 45 houses is not an HCA.

30 Inch Diameter Pipeline at 1000 psig (PIR = 655 ft.)
## NPRM HCA Definition of January 28, 2003 (Inconsistency) (cont)

<table>
<thead>
<tr>
<th>Diameter</th>
<th>MAOP</th>
<th>PIR</th>
<th>PIZ</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>100</td>
<td>28</td>
<td>300</td>
</tr>
<tr>
<td>6</td>
<td>200</td>
<td>59</td>
<td>300</td>
</tr>
<tr>
<td>8</td>
<td>300</td>
<td>96</td>
<td>300</td>
</tr>
<tr>
<td>10</td>
<td>400</td>
<td>138</td>
<td>300</td>
</tr>
<tr>
<td>12</td>
<td>500</td>
<td>185</td>
<td>300</td>
</tr>
<tr>
<td>16</td>
<td>700</td>
<td>292</td>
<td>300</td>
</tr>
<tr>
<td>20</td>
<td>600</td>
<td>338</td>
<td>660</td>
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<tr>
<td>24</td>
<td>1000</td>
<td>524</td>
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<tr>
<td>30</td>
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<tr>
<td>30</td>
<td>1020</td>
<td>661</td>
<td>1000</td>
</tr>
<tr>
<td>36</td>
<td>700</td>
<td>657</td>
<td>660</td>
</tr>
<tr>
<td>42</td>
<td>800</td>
<td>820</td>
<td>1000</td>
</tr>
<tr>
<td>36</td>
<td>2180</td>
<td>1160</td>
<td>1334</td>
</tr>
</tbody>
</table>
NPRM HCA Definition of January 28, 2003 (Data Issues)

• Industry has collected house data since 1970 to 660 feet from pipelines
• Industry has collected "outside area" data since 1970 to 300 feet from pipelines
• Collecting house data within one year beyond 660 feet is unrealistic
• Collecting data beyond 49 CFR 192 definitions will create undue burden on operators
NPRM HCA Definition of January 28, 2003 (Language Consistency with 49 CFR 192 and 195)

- Identified Site
  - Inclusion of buildings
  - 50 days/year instead of 5 days/week
- 20 Persons is not consistent with Hazardous Liquid HCA definition
- Use of evenly spaced Class 3 density does not address the reality of population distribution
The Goal of Integrity Management

• The law says to "conduct an analysis of the risks to each facility located in an area identified" as a high consequence area, "and shall adopt and implement a written integrity management program for such facility to reduce the risks."
The Goal of Integrity Management (cont)

• The January 28, 2003, Preamble says to "establish a rule to require operators to develop integrity management programs for gas transmission pipelines that, in the event of failure, could impact high consequence areas."
The Goal of Integrity Management (cont)

• Industry's goals within these broad requirements are and have always been:
  – Any determination of HCA or any inspection requirement should be technically based
  – New requirements should, to the degree practical, follow existing practices and processes used by the industry
  – Maximum use of existing house data
Alternate INGAA / AGA Proposed Definition

Recognizing that the Pure approach is not practical at this time, the proposal offered will bridge the gap of regulatory practicality with the science of identifying high consequence areas within the confines of the law, existing regulations and historical applications of the regulations.
Flowchart for Alternate INGAA / AGA Proposed HCA Definition
Examples of How Alternate INGAA / AGA Proposed HCA Definition Will Work
Application of INGAA / AGA Proposed HCA Definition

- Single Licensed Day Care With 3 Persons Is Not an HCA (Revised from NPRM) - PIR + 15%
- Office Building with 50 Persons Is an HCA (Revised from NPRM) - 1000 feet
- 30 Inch Diameter Pipeline at 1050 psig (PIR = 671 ft.)

30 Inch Diameter Pipeline at 1050 psig (PIR = 671 ft.)
Application of INGAA / AGA
Proposed HCA Definition

20 houses within 1000 feet
Is Not an HCA (Revised from NPRM)

35 houses within 660 feet
Is an HCA (Revised from NPRM)

PIR + 15%

1000 feet

660 feet

300 feet

Class 2 at 1020 psig

Class 2 at 1000 psig

Pipeline

30 Inch Diameter Pipeline at 1050 / 1000 psig (PIR = 671 / 655 ft.)
Application of INGAA / AGA Proposed HCA Definition

<table>
<thead>
<tr>
<th>Distance</th>
<th>Description</th>
<th>PIR + 15%</th>
</tr>
</thead>
<tbody>
<tr>
<td>1000 feet</td>
<td>20 houses within 1000 feet</td>
<td></td>
</tr>
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<td></td>
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<td></td>
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<td>660 feet</td>
<td>30 Inch Diameter Pipeline at 1050 psig (PIR = 671 ft.)</td>
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</tr>
<tr>
<td></td>
<td>Building of 50 Persons</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Is an HCA (Revised from NPRM)</td>
<td></td>
</tr>
<tr>
<td>300 feet</td>
<td>20 houses within 1000 feet</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Is Not an HCA (Revised from NPRM)</td>
<td></td>
</tr>
</tbody>
</table>

Pipeline
Application of INGAA / AGA Proposed HCA Definition

PIR + 15%

1000 feet

Houses are equally spaced in each area

1000 feet

660 feet

300 feet

Class 3 with 55 houses
Is an HCA

Class 2 with 35 houses
Is an HCA (Revised from NPRM)

Pipeline

30 Inch Diameter Pipeline at 1000 psig (PIR = 655 ft)
Contrasting the NPRM HCA Definition With the INGAA / AGA Proposed HCA Definition
INGAA / AGA Proposed HCA Definition

- Examines every foot of pipeline for HCA's
- Extensively uses data developed over 30 years to precisely examine land use for true HCA's
- Enables operator to evaluate the entire system for HCA’s on much higher resolution regardless of class
INGAA / AGA Proposed HCA Definition (cont)

- Uses science, proven by field experience, to greatest extent possible
- Treats all areas the same, i.e. 20 houses equals 20 houses regardless of class location
- Existing processes are maximized without loss of pipeline safety (5 days/week vs. 50 days/year)
INGAA / AGA Proposed HCA Definition (cont)

• Focus is on inspections of pipelines, not gathering large amounts of data to define potential HCA’s

• Is not confusing in application, so public, regulators, and operators understand definition
INGAA / AGA Proposed HCA Definition (cont)

- Addresses structures housing impaired mobility through usage level and existing processes, not intensive data collection
- Includes reasonable, technically-based portions of NPRM (definitions of identified site, Class 3 and 4, 20 houses)
• With bifurcation, HCA definition permits operator to largely use Final Rule of August 6, 2002, or intensively examine PIC with best science
• Permits focus to be on true HCA's while eliminating inconsistent applications
Questions?