Cost-Benefit Analysis at the Office of Pipeline Safety

Presentation to:
Committee for the Study on Propane Gas Pipeline Facilities
Transportation Research Board of the National Academies
August 24, 2017
Overview

• Requirements/policies/procedures for conducting cost benefit analysis

• Example: Small Liquefied Petroleum Gas (LPG)

• Q&A
Requirement for Cost-Benefit Analysis

• Statutory requirement
  – The Pipeline Safety Statute 49 USC § 60102 ((b)(2))

• Executive Order
  – Executive Order 12866, Regulatory Planning and Review
  – Circular A-4, "Regulatory Analysis"

• Department of Transportation (DOT) policy
  – Rulemaking Requirements
Statutory Requirements

**49 USC § 60102 ((b)(2)) Factors For Considerations**

(A) relevant available—(i) gas pipeline safety information; ..(iii) environmental information;

(D) based on a risk assessment, the reasonably identifiable or estimated benefits expected to result from implementation or compliance with the standard;

(E) based on a risk assessment, the reasonably identifiable or estimated costs expected to result from implementation or compliance with the standard

**49 USC § 60102 ((b)(3)) Risk Assessment**

(A) identify the regulatory and nonregulatory options that the Secretary considered in prescribing a proposed standard;

(B) identify the costs and benefits associated with the proposed standard;
Procedures for Regulatory Impact Analysis (RIAs)

- **Executive Order 12866** requires agencies to conduct a regulatory analysis for economically significant regulatory actions as defined by Section 3(f)(1).

- **OMB Circular A-4** provides guidance for a “good regulatory analysis;” standardize how benefits and costs are measured and reported.
  - [Primer](#)

- **DOT valuation guidance** standardizes economic values used for DOT modes (DOT requires economic analysis for all proposed and final rulemakings, not just major or economically significant).
  - Revised guidance on VSL
  - Revised guidance on travel time

- RIAs are Reviewed by
  - DOT Office of the Secretary
  - OMB significant rules (section 3(f) of EO 12866)
  - **PHMSA - Pipeline Advisory Committees**
Basic Steps (Circular A-4)

- Describe need for regulatory action
- Define the baseline
- Set the timeframe of the analysis
- Identify a range of alternatives
- Identify consequences of alternatives
- Quantify and monetize benefits and costs
- Discount future benefits and costs
- Evaluate nonquantified and nonmonetized benefits and costs
- Characterize uncertainty in benefits, costs, net benefits
Guidance for A Good Analysis (Circular A-4)

• Transparent
  – Assumptions are clearly stated
  – Models are documented
  – Results are reproducible

• Data sources are properly referenced

• Benefit-Cost Analysis (BCA) and Cost Effectiveness Analysis (CEA) can be used
  – OPS traditionally utilizes BCA
Preliminary Consideration in Policy Analysis

- **Identify issue**
  - Congressional Mandates, Judicial Directives
  - GAO, IG, NTSB Recommendations
  - Industry, NAPSR Petitions
  - PHMSA Internal Findings/Recommendations

- **Assess safety risk**
  - SMEs, incidents/accidents; other federal/state partners, external sources

- **Evaluate approaches to the issue**
  - Regulatory/nonregulatory options
  - Regulatory Support Paper
    - Show that regulation at the federal level is best way to solve problem

- **Develop preliminary cost and benefit information**
  - Assess data availability
  - Same principles as for regulatory evaluation
Summarizing Requirements for CBA

- Proposed Actions only (Statute)
- Proposed Actions and Alternatives for Significant Rules only (EO 12866)
- Proposed Actions and Alternatives for All Regulatory Actions (DOT)
- Preliminary Estimates for Evaluating All Issues Requiring Policy Analysis (OPS)
Baseline for the Analysis

• Identify and Estimate Affected Entities

Potential Information/Data Sources
- Annual Report, National Registry, National Pipeline Mapping System
- Other Federal agencies
- FEDSTAR (State submission to PHMSA)
- Industry Trade Groups, NAPSR, Public Interest Group
- Information collection and notices (i.e. ANPRMs, comments on NPRM and preliminary analyses)
- Subject Matter Experts (SME)

• Current Compliance Issues

Potential Information/Data Sources
- Existing Regulatory Requirements (Federal, State, Local)
- Written Incident Reports, Safety Related Condition Reports, Special Permit Requests, PHMSA Inspection and Enforcement database
- Information collection and notices (i.e. ANPRMs, comments on NPRM and preliminary analyses)
- State Partners; Public Interest Group; Industry Group
- Subject Matter Experts (SME)
Compliance Actions and Costs

- Identity regulatory alternatives based on the risk assessments conducted by SMEs

- Identify compliance actions, where necessary for each regulatory alternative, based on SME judgments

- Estimate costs necessary for compliance
  - Estimate appropriate capital and O&M costs
    - One time capital
    - Recurring operational
    - Recordkeeping, reporting
Compliance Costs

• Unit Cost estimates are based on
  – SME estimates
  – Vendor prices/estimates (e.g., contract to develop unit costs)
  – Public comments (response to ANPRM; NPRM and preliminary RIA), petitions, solicit existing information)
  – Industry Trade Groups

• Total Cost estimates are based on scope
  – Existing operators with existing pipes;
  – Existing operators with new pipes (if the scope changes);
  – New operators with new pipes (if the scope changes);
Compliance Actions and Benefits

- Based on the risk assessment, identify both qualitative and quantitative benefits

- Discuss qualitative benefits for each alternative
  - Qualitative analysis of unquantified/monetized benefits

- Estimate quantitative benefits for each alternative
Net Benefits

• Annualized benefits minus annualized costs
  – Compliance schedule; discounting

• Non-monetized benefits
  – Agency may be able to quantify but not monetize
    • Increases in environmental quality

• Break-even analysis
  – Number of incidents that need to be avoided for benefits to equal costs
Characterize Uncertainty in the Analysis

• RIA requires forecast about the future

• Uncertainty analysis presents “best estimate” reflecting expected value of benefits and costs

• Identify factors that may impact baseline assumptions
  – Mileage and number of services/customers (unregulated); unit costs
  – Unreported, underreported incidents, or estimated incident consequences

• Document assumptions for forecast:
  – Future incidents and consequences
    • Assuming future looks like past?
Uncertainty - Evaluation

• **Key uncertainties**
  – Unit costs for pipeline assessments (a number of methods can be used to comply - pressure test, In line inspection, direct assessment)
  – Effectiveness of regulation (# incidents prevented)
  – Consequences of incidents (monetizing what we capture in the incident reports only)

• **Evaluation methods**
  – Ranges – upper and lower bounds
  – Sensitivity analyses - recalculate net benefits under different assumptions
  – Monte Carlo analysis – assign probabilities and calculate expected values
Example: Safety of Small LPG Systems

- Understanding PHMSA data: collected/linked by OPID
  - §191.22 defines an OPID as a number assigned to an operator for the pipeline or pipeline system for which the operator has primary responsibility and use it for all reporting requirements;
    - An operator may have multiple OPIDs
    - Use the unique OPID for reporting on the pipeline or pipeline systems
## Example for LPGs

**Baseline: What do we currently know**

<table>
<thead>
<tr>
<th>Operators with</th>
<th>National Operator Registry</th>
<th>Annual Reports</th>
<th>Incident Reports</th>
<th>Inspection/Enforcement</th>
<th>192 Regs (examples)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;10 customers</td>
<td>Currently exempt (&lt;10 and no portion is in public place and Single customer and entirely on customer’s) no information in PHMSA database</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt; 100 customers from a single source</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>FL, HI, WI (in PHMSA database)</td>
<td>192.616 (j) Public awareness less stringent for Petroleum gas operators ; 192.1015 DIMP</td>
</tr>
<tr>
<td>100 or more customers</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>FL,HI, MO, PA, PR, WI</td>
<td>192.1003-1192.1013 DIMP</td>
</tr>
</tbody>
</table>
Information from PHMSA’s Natural Gas Annual Reports

<table>
<thead>
<tr>
<th></th>
<th>Gathering Miles</th>
<th>Transmission Miles</th>
<th>Distribution Main Miles</th>
<th>Number of Distribution Services</th>
</tr>
</thead>
<tbody>
<tr>
<td>Natural Gas</td>
<td>17,817</td>
<td>297,518</td>
<td>1,283,930</td>
<td>67,909,917</td>
</tr>
<tr>
<td>Synthetic Gas</td>
<td>129</td>
<td>612</td>
<td>34,441</td>
<td>34,441</td>
</tr>
<tr>
<td>Hydrogen Gas</td>
<td>1,612</td>
<td>1</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Propane Gas</td>
<td>&lt;1</td>
<td>1,381</td>
<td></td>
<td>72,863</td>
</tr>
<tr>
<td>Landfill Gas</td>
<td>234</td>
<td>33</td>
<td>14</td>
<td></td>
</tr>
<tr>
<td>Other Gas</td>
<td>1,294</td>
<td>72</td>
<td>15</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>17,817</strong></td>
<td><strong>300,787</strong></td>
<td><strong>1,286,028</strong></td>
<td><strong>68,017,250</strong></td>
</tr>
</tbody>
</table>
## Type of Operators in Natural Gas Distribution Annual Reports

<table>
<thead>
<tr>
<th>COMMODITY</th>
<th>Propane Gas</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>State Of Operation</td>
<td>(All)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Type of Operators</th>
<th>Distribution Main Miles</th>
<th>Distribution Service Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cooperative</td>
<td>4</td>
<td>106</td>
</tr>
<tr>
<td>Investor Owned</td>
<td>749</td>
<td>36,067</td>
</tr>
<tr>
<td>Municipal Owned</td>
<td>21</td>
<td>812</td>
</tr>
<tr>
<td>Privately Owned</td>
<td>608</td>
<td>35,878</td>
</tr>
<tr>
<td><strong>Grand Total</strong></td>
<td><strong>1,381</strong></td>
<td><strong>72,863</strong></td>
</tr>
</tbody>
</table>
National Operator Registry and Small LPGs

- [https://phmsa.dot.gov/staticfiles/PHMSA/DownloadableFiles/Files/OpID_Assignment_Form_PHMSA_F1000_1_rev5_2015.pdf](https://phmsa.dot.gov/staticfiles/PHMSA/DownloadableFiles/Files/OpID_Assignment_Form_PHMSA_F1000_1_rev5_2015.pdf)

(Add States as needed)

For Gas Distribution, the pipelines and/or facilities covered by this OPID Assignment Request are: (select Type(s) of Operator)

3a. Type of Operator (select all that apply):

- [ ] Municipally Owned State: /____/ Miles: /____/______/______/______/______/______/______/______/______/____%/ (Add States as needed)
- [ ] Privately Owned State: /____/ Miles: /____/______/______/______/______/______/____%/ (Add States as needed)
- [ ] Investor Owned State: /____/ Miles: /____/______/______/______/______/______/____%/ (Add States as needed)
- [ ] Select this box if the LPG Distribution pipeline(s) and/or facility(ies) serve fewer than 100 customers from a single source.
- [ ] Cooperative State: /____/ Miles: /____/______/______/______/______/______/____%/ (Add States as needed)
- [ ] Master Meter State: /____/ Miles: /____/______/______/______/______/______/____%/ (Add States as needed)
- [ ] Other Ownership (State: /____/ Miles: /____/______/______/______/______/______/____%/ (Add States as needed)

Describe Ownership: ________________________________
Information on Small LPGs in PHMSA databases

- There are currently 910 OPIDs for small LPGs in National Operator Registry database

- There are 890 OPIDs in FEDSTAR
Example: Small LPG Baseline

- Approximately 890-910 OPIDs serving <100 customers
  - Exceptions granted for <10 customers and no public place as well as single customer entirely on customer’s premise
  - Limited Federal information
  - States/Industry Trade Groups may have more details than PHMSA

- Federal requirements, e.g., § 192.1015
  - Develop/implement integrity management (IM) under the Distribution Integrity Management Program (DIMP; 2009)

- State Requirements
  - State(s) may have stringent requirement than Federal Minimum Standards

- Incident history
  - Limited Federal information (written report only if it meets requirements, may research identifying small LPGs)
Compliance Action
Example from for Small LPGs

• Importance of defining an “operator” in the analysis
  – An “operator” may have 1 OPID for several of its operations or Multiple OPIDs for each of its operations
  – OPID as Operating Entity for analytical purpose
  – Costs are borne at the operator level
    • Same cost no matter the size of the operation (miles, number of services)
  – Certain costs are directly related to the infrastructure they operate

• Industry characteristics
  – All “operators” are not equal in terms of miles and infrastructure

• Current cost of operation for an “average” operator?
  – Need for defining “average”, “typical”, “low end”, “High end”
Compliance Action

Example from DIMP for Small LPGs

Cost Calculations

Baseline Costs for § 192.1015

• Both one time and recurring costs
  – One time cost for developing and implementing a written IM Program
  – Recurring costs for updating the plans, record keeping
  – No capital cost

• DIMP is performance based
  – If the safety goals do not change, a performance based plan already incorporate the cost savings at the operator level

• Identify the new cost of compliance and estimate the incremental change

• Consider the State Regulations
  – If State(s) have identical stringent regulations, a federal rule change that lowers the compliance standard may not translate into cost savings (unless state(s) change their rules at the same time)
Compliance Action
Example from DIMP for Small LPGs
Benefits Calculations

• Identify the type and number of incidents that would be saved by the proposed changes
  – Calculate the property damages, monetize the fatalities and injuries
  – Monetize the gas lost, service disrupted, evacuations, if possible
  – Non monetized, quantifiable benefits are acceptable

• If no incident is identified or the proposed changes do not consider any changes in safety benefit
  – Cost savings without compromising the safety?
Compliance Action

Example from DIMP for Small LPGs
Characterize Uncertainty in the Analysis

• Benefits may not be captured for all incidents/failures
  
  – PHMSA’s written reports capture incidents that met the definition of Incident in §191.3
  – Small dataset/timeframe for baseline?
    • Until recently (2010), propane release could not be identified
  – Operators report the data and may not fully capture public or non operator consequences
  – Incidents for unregulated systems not reported to PHMSA
  – All states may or may not capture consistent data
Compliance Action

Example from DIMP for Small LPGs

Regulatory Alternatives

• In general, OPS analyzes at least three regulatory alternatives based on the risk assessments

Example of changes

– Alternative 1: No changes (baseline)
– Alternative 2: Revise §192.1015 (proposed)
– Alternative 3: Apply §192.1005-1013 requirements to small LPGs
– Alternative 4: Apply §192.1009 only

• Each alternative needs to be evaluated
Q&A
Contact information

Piyali Talukdar, Ph.D.
Economist
Office of Planning and Analytics
PHMSA
(202) 821 6314
Piyali.Talukdar@dot.gov

Eloise Castillo
Economist
Office of Planning and Analytics
PHMSA
(202) 366-5362
Eloise.Castillo@dot.gov