Mary Jane Wilson

- Background and Experience
  - Education-Stanford University Petroleum Engineering
  - Business roles
    - Runs an energy and environmental consulting business
    - Distinguished Lecturer for SPE
    - Editor of Environmental Monograph for SPE
    - Testifying Expert on behalf of O&G companies
  - Governmental Advisory roles
    - Appt. by Congress to Review Naval Petroleum Reserve1
    - National Petroleum Council
    - Special Govt. Employee for Ultra-Deepwater Advisory Committee
    - Petroleum Technology Transfer Council

2014 Rulemaking for Oil and Gas

- WZI participated as a technical expert in this rule making at the request of EDF
- Summary of Key Findings:
  - CDPHE used accepted methodology:
    - In establishing the emission inventory
    - In assigning emissions reductions for proposed alternatives
    - In calculating the cost-effectiveness of program alternatives
- CDPHE cost estimates are reasonable and show program will be cost effective in reducing VOC and methane

LDAR

- Historically, LDAR has been in place in numerous facilities and air basins in various forms since the 80's
- LDAR interfaces well with Planned Maintenance cycles which are focused on anticipating equipment failure and proactive maintenance
- LDAR programs in various forms have proven cost effective in reducing emissions
- Our opinion is that LDAR contributes to overall improvement of facility operations

CDPHE Proposed LDAR

- Tier-based approach results in sliding costs with lowest emitters bearing the least cost
- The CDPHE proposed reporting framework has a relatively minimal paperwork burden as compared to other LDAR programs
- The proposed LDAR program balances diminishing returns on emission reductions with industry costs

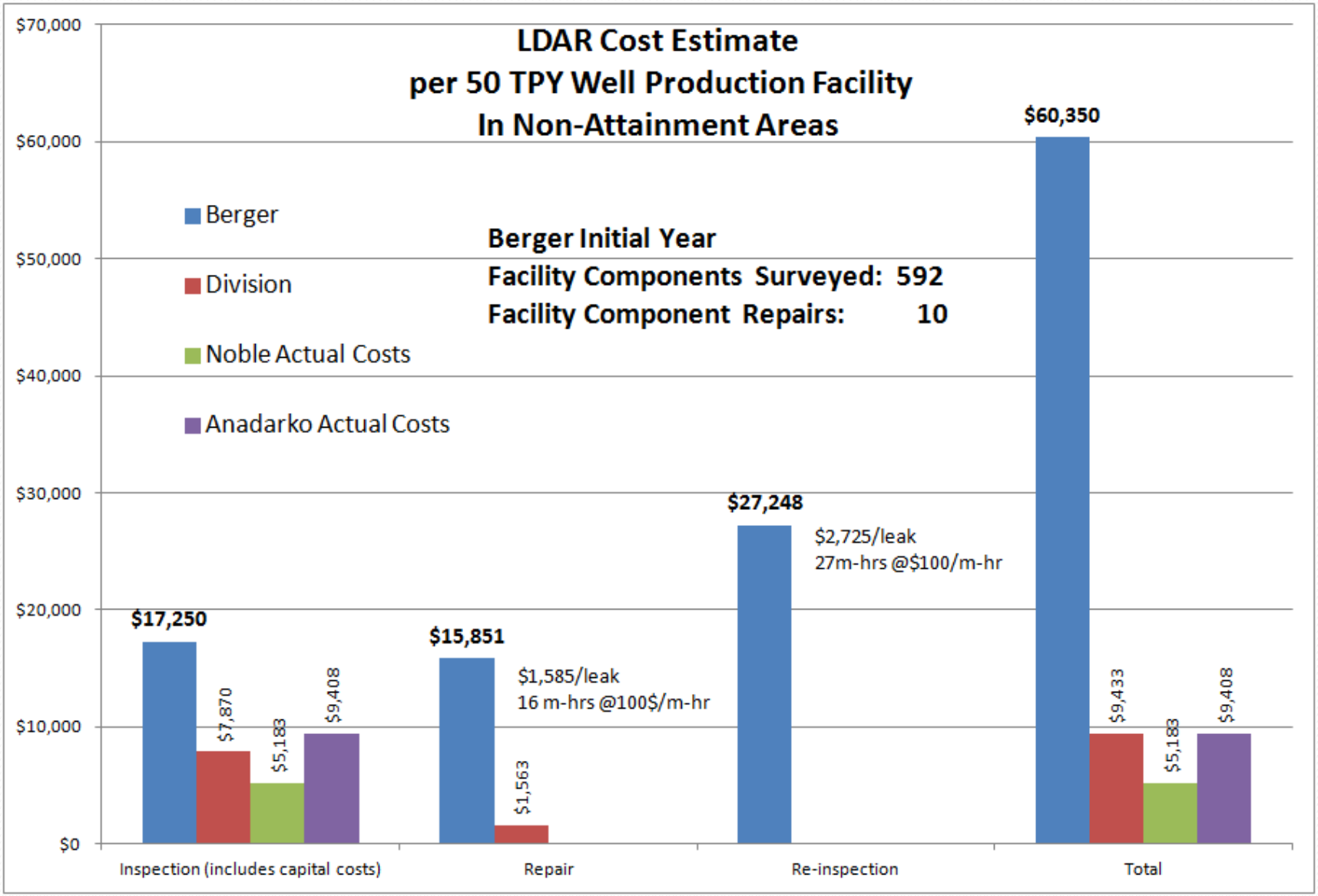
Louis Berger Group Program Economic Analysis: Key flaws

- Inflated Costs for:
  - LDAR
  - STEM
  - Flares
- Incorrect Methodology for cost effectiveness

Inflated Costs

- LDAR
  - LDAR equipment maintenance and training
  - Component Repair (10 times expected values)
  - Repaired Component Re-inspection (twice as high as complete facility inspections- **done 12 times per year**)
  - Findings are contrary to Economy-of-Scale expectations

Comparative Example-



Buffer Bottles as control devices

Separator

Buffer Bottle

Inflated Costs

- STEM
  - Buffer Bottle Capital Costs and Maintenance Costs are overstated
  - Similar errors as shown in prior LDAR discussion
- Flares
  - Inflated Costs
  - Useful life is understated
  - Overstated Maintenance Costs
- STEM and Flares are still cost effective regardless of overstatement of costs

Incorrect Methodology

- Berger developed a sliding emissions inventory year-to-year
- EPA cites the use of a fixed datum (baseline)
  - Baseline is established as a pre-rule inventory condition
  - Program effectiveness is tied to the pre-rule minus post-rule emissions inventories
- Incremental reductions year-to-year simply underscore the degree of progress (trajectory) toward the final program control effectiveness
- Berger costs are skewed by levelized NPV calculations

Best Management Practices

- Best Management Practices for well maintenance such as swabbing and liquids unloading has been and will continue to be a general oil and gas industry practice.
- Examples:
  - When swabbing in a well, use temporary or permanent equipment to
    - Capture gas and send to gas treatment system or reinject
    - Flare gas to permanent or temporary flare
  - Limit unloading frequency and duration
  - Install lift equipment or automatic controls that reduces or eliminates the need for unloading
  - Correct problems with well completion and infrastructure

Conclusion

- CDPHE proposal is practical and applies common sense and reasonable approaches to control emissions from oil and gas operations
- Program is carefully tailored so that sites with fewer emissions have fewer requirements
- Program is cost effective
- Program will achieve large reductions in emissions