Alternative Suppressants in Fire Protection Systems

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Workshop on Stationary High GWP Early Action Items

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Outline

- Background
- Emissions and Trends
- Alternatives
- Existing Regulations
- Potential Mitigation Strategies
- Costs
- Considerations and Outstanding Issues
- Detailed timeline

Background

- Two main types of fire suppression systems
  - Total flooding systems:
    - Fixed systems
    - Subset use clean agents that have no residue and are non-conductive
      - Used to protect sensitive equipment, materials, etc.
      - Used in a variety of applications: oil and gas operations, museums, computer and telecommunications rooms
  - Streaming systems:
    - Portable or hand-held systems
- Agents include:
  - Halons for old systems and a few niche-use new systems
  - High global warming potential gases and
  - Agents with no ozone depleting or global warming potentials

Background

- Halons are:
  - compounds consisting of 1-2 carbon atoms combined with bromine and one or more other halogens (e.g., Fluorine, Chlorine).
  - 3-10 times more destructive to the ozone layer than CFCs
- Halons used in portable (streaming) and fixed (total flooding) systems prior to Montreal Protocol
  - Halon production phased out under MP
  - Halon import limited
  - Halon Bank developed for recycling, mainly for specialized uses (submarine, tanks, planes, etc.)
- Currently few new Halon systems outside of niche uses

Agents in Total Flooding Systems

- Halon 1301:
  - Low cost, effective, and most compact systems
  - Few new Halon systems but older systems still exist
- Many new systems use HFC-227ea or a non-clean agent such as water mist
  - Non-GWP agents took approximately 84% of market (Non-clean agents 74% and Inert gas 10%)
  - HFC-227ea took 16% of Halon market (EPA 2006)
- Other clean agents (<1%) include:
  - HFC-23, HFC-125, HFC-236, Fluorinated ketone, HFC blends, CO_2

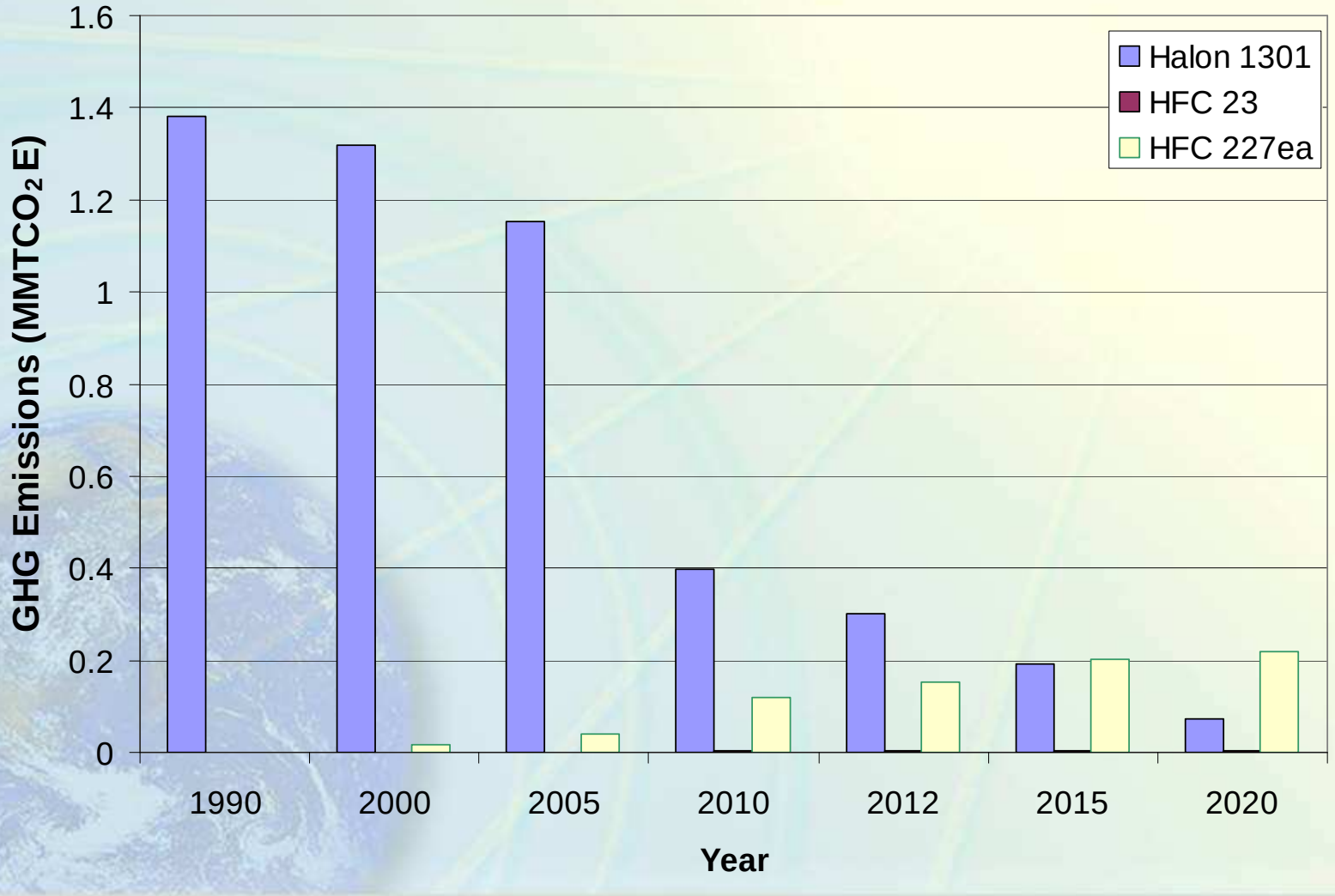
Comparison of total flooding fire suppressants

	Clean	Cost in US$ (for system protecting 500 m^3)	Weight increase (relative to 1301)	Space increase (relative to 1301)	GWP/ODP
Halon 1301	Y	5,300	-	-	7,030/10
HFC-23	Y	22,000	200%	105%	11,700/0
HFC-227	Y	16,000	50%	20%	2,900/0
Fluorinated ketone	Y	19,000	50%	20%	1/0
CO_2	Y	11,000	150%	84%	1/0
Inert Gas	Y	20,000	400%	327%	N/A
Water mist	N	60,000	625%	1,119%	N/A

Total Flooding Systems

- Emissions occur through leakage or use of the system
  - Adjusted from US Vintaging model
  - Overall loss of agent estimated at 1.5% annually over 20 years
    - 20 years is assumed lifetime
    - Banks may be under-estimated because some systems last longer than 20 years

Greenhouse Gas Emissions from Total Flooding Fire Suppression in California ($MMTCO_2E$)



Voluntary Actions

- Voluntary Code of Practice for the Reduction of Emissions of HFC and PFC Fire Protection Agents
  - Initiative of the US Environmental Protection Agency and fire protection industry including:
    - Halon Alternative Research Corporation
    - Fire Equipment Manufacturers' Association
    - Fire Suppression Systems Association
    - National Association of Fire Equipment Distributors
  - Encourages:
    - Recovery and recycling of agent
    - Maintenance practices that reduce leakage
    - Leak resistant equipment that is routinely inspected
    - Limit GHG agent release during discharge testing
    - Technician training
    - Recordkeeping and reporting
- Are considering incorporating the code into regulatory requirements

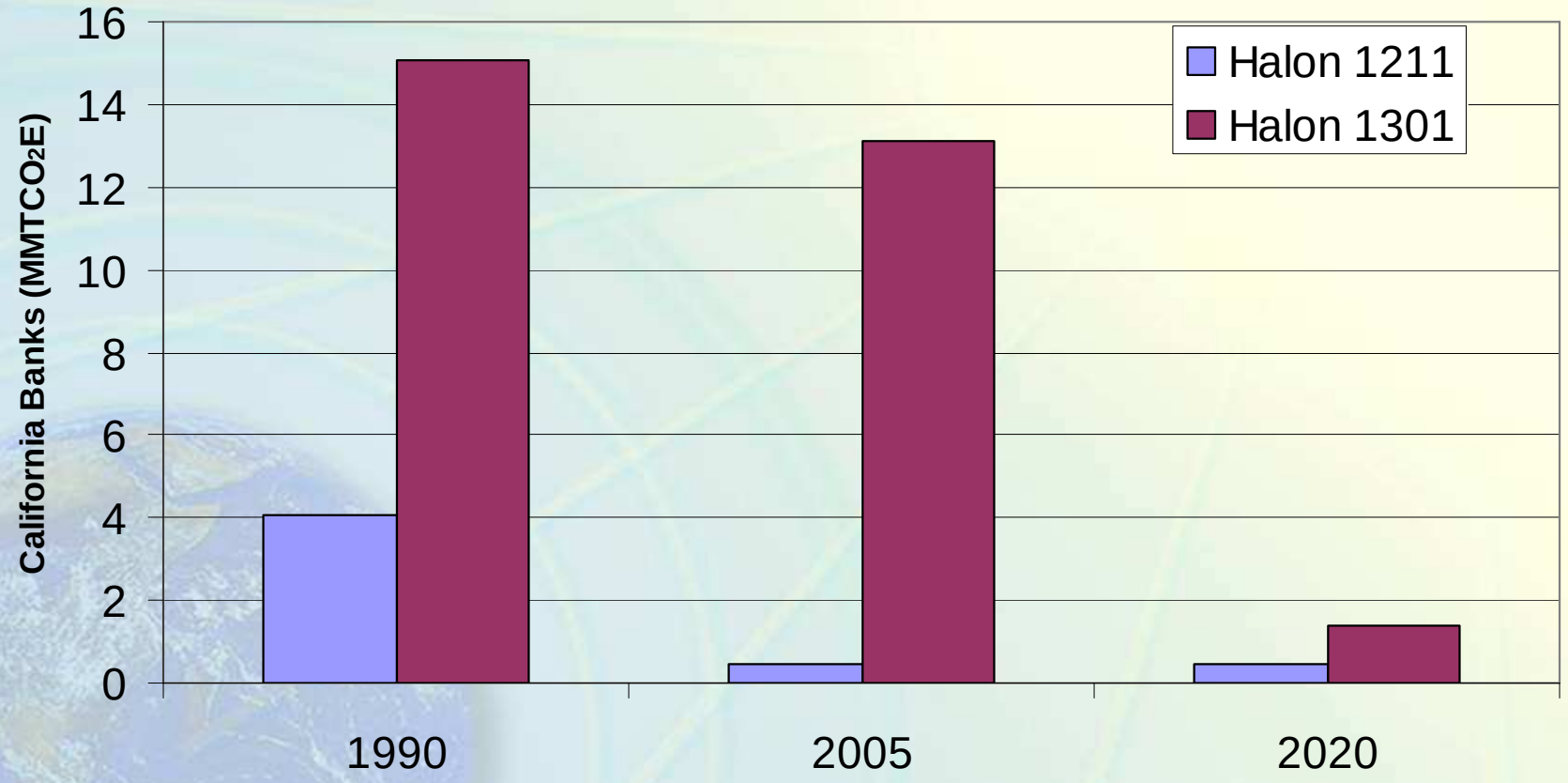
Total Flooding Systems

- Considerations:
  - Size and weight constraints
  - Toxicity (use allowed in occupied space?)
  - Cost
  - Effectiveness & deployment delay
  - Clean agent status
- Will a restriction result in less use of clean agents or a total flooding system?
  - Cost of lower protection levels?

Streaming Options

- Halon 1211
- Alternatives:
  - HCFCs (production phase-out in 2015)
  - CO_2
  - Foams
  - Dry chemicals
  - PFCs and HFCs (PFC-614, HFC-236fa and HFC-134a)

Banks of Halons in Fire Extinguishing



International Experience

- Non-critical Halon systems forced into decommissioning in Europe by end of 2003
  - Venting may have occurred at significant levels
- Denmark has banned HFC use in fire suppression
- Switzerland only allows HFC use only if safety of people cannot otherwise be assured
- European Union has not addressed HFC use in fire suppressant systems

Potential Options

Working with California State Fire Marshal

- Most options would be implemented under the Building Codes through the State Fire Marshal's Office

New System Options:

- GWP threshold or encouragement of voluntary use of lower GWP agents

Existing System Options:

- End of life and decommissioning options

Both New and Existing Systems:

- Leak reduction, training, reporting, end of life options
- Mitigation fee for High GWP and Halon fire suppressant usage to offset climate impact

Others?

Costs

- For total flooding systems, EPA estimates costs at $35 to over $80/MTCO$_2$E for new systems using low or no GWP agents instead of HFCs
  - Costs reflect agent costs, system costs, and space needs
- No cost estimates for streaming systems but likely to be lower since infrastructure changes are smaller
- Denmark costs under $35/MTCO$_2$ for tax & limited ban on High GWP gases – not specific to one sector or gas

Key Questions and Issues

- Emissions and information on number of systems using each type of agent
- Applicability of options/emission reductions
  - Evaluate effectiveness, toxicity, and life-cycle emissions
    - High GWP inventory and life-cycle analysis underway
    - Toxicity and effectiveness evaluated by federal agencies and industry, will rely on current data
- Cost information
- Regulatory Options
- Additional Stakeholders

Draft Schedule

Mid 2008	Working Group Formation
Late 2008	First WG meeting
Spring 2009	Second WG meeting
Summer 2009	Public Workshop to discuss regulatory concepts
Winter 2009	Third WG meeting
Spring 2010	Public Workshop on proposed regulation
Fall 2010	Draft ISOR available
Spring 2011	Regulatory language and ISOR finalized
December 2011	Board meeting on action

Summary

- Comments and Suggestions are welcomed!
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- For More Information:
  - Visit: http://www.arb.ca.gov/cc/altsup/altsup.htm
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