

U.S. Consumer Product Safety Commission



Status Update on Regulatory Options for Upholstered Furniture Flammability*

CPSC Staff Briefing
February 23, 2006

*This information was prepared by the CPSC staff; it has not been reviewed or approved by, and does not necessarily represent the views of, the Commission.

Background

- October 2003 ANPR expanded CPSC proceeding to cover risk of fire from both smoldering & open flame ignition
- Previous (1994) ANPR addressed only small open flame ignition
- Revisions of draft standard presented at October 2004 & May 2005 public meetings
- Current version (staff's 2005 revised draft) in January 2006 briefing package

January 2006 Briefing Package

- Updates fire hazard data
- Summarizes staff's research and evaluation of stakeholder input
- Describes staff's current draft standard
- Presents preliminary regulatory analysis of current staff draft standard and significant alternatives
- Presents FR chemical preliminary health risk assessment and preliminary environmental assessment

Regulatory Options for Possible NPR

- CPSC staff's current (2005) revised draft
- CPSC staff's previous (2001) draft small open flame standard
- 2004 industry-recommended standard
- 2002 draft revised California standard TB-117 ("TB-117+")
- Variations on the CPSC staff's 2005 draft:
 - Smoldering provisions only
 - Loose fill open flame provisions deleted
 - Cover fabric open flame provisions added
- No action

Fire Hazard Update

- Average annual national fire loss estimates, 1999-2002 - addressable residential fires in which upholstered furniture was 1st item ignited:
 - 4,800 non-intentional fires
 - 360 civilian deaths
 - 740 civilian injuries
 - \$133 million property damage
- Annual average societal costs of addressable fire losses = \$2.1 billion
- 83% of deaths and 65% of injuries resulted from smoking material-ignited fires

Key Elements of CPSC Staff's Standard Development Approach

- Develop performance requirements to address smoldering and open flame ignition
- Consider elements of existing standards
- Incorporate findings of recent technical research
- Consider stakeholder data & recommendations
- Provide flexibility in compliance methods for manufacturers / importers
- Consider potential costs & benefits, seek burden-reducing alternatives
- Recognize and assess FR chemical health & environmental concerns

Standard Development: Stakeholder Recommendations

- Use material / component performance tests
- Emphasize smoldering ignition
- Adopt elements of existing standards
- Incorporate fire barrier option
- Consider various recommendations on test scope, ignition sources and acceptance criteria
- Establish controls on standard test materials
- Conduct large scale testing to evaluate effectiveness

Key Research Findings

- Delaying fire growth / onset of untenable conditions allows additional escape time
- Bench scale mockup test configuration used in existing standards (ASTM/UFAC, U.K., Calif.) may adequately represent fire behavior of finished articles
- Mass loss over time is a reasonable indicator of fire severity
- Highly cigarette ignition-prone fabrics can overwhelm smolder resistant non-FR fillings

Highly Smolder-Prone Fabric Over Non-FR Foam & Polyester Batting



Key Research Findings

(continued)

- Best-performing cover barriers can provide adequate protection for flammable fillings
- Best-performing interior barriers can provide adequate protection for flammable fillings with burning cover fabrics
- Resilient (foam) fillings similar to those meeting 2002 revised draft 'TB-117+' can contribute to both open flame protection and smolder resistance

Open Flame-Ignitable Fabric with Conventional Fillings vs. Interior Barrier



Time = 2:20 after ignition

Key Research Findings

(continued)

- Industry-proposed open flame fabric component test does not adequately distinguish fabric performance
- Loose filling requirements can contribute significantly to open flame resistance (in backs of about 50% of units produced)
- Standard test materials can be used but must be carefully controlled to maintain repeatability

Developing Standard Test Materials

- Standard cover fabric and foams
 - CPSC Laboratory used smolder-prone cotton velvet, as specified in TB-117 smoldering tests, in smoldering and open flame materials tests
 - Performed consistently in earlier CPSC Laboratory tests; exhibited variability in recent open flame tests
 - Standard FR urethane foam also exhibited some variability in air flow, FR content
 - Qualifying performance-band specifications for fabric and foams added to draft standard; any material that meets specifications is permissible

Improving Standard Test Fabric Repeatability

- Working with cotton velvet manufacturer to identify causes of variability and develop more consistent performing fabric
- Continuing to evaluate other candidates, e.g., among existing test fabrics, for possible use in open flame tests
- Other alternatives:
 - Develop consistent gas burner to represent cover fabric
 - Perform open flame tests without standard fabric (e.g., bare foam sample)

Large Scale Research Status

- **Inter-agency agreement with NIST**
 - Compare bench scale and larger scale mockup test results
 - Establish appropriate parameters to measure fire intensity
 - Estimate time to untenable fire conditions
 - Approximate real-world fire performance

Large Scale Research Status

(continued)

- Pilot study phase testing at NIST completed December 2005
 - Limited selection of readily available materials, no complying vs. non-complying mockup pairs; pilot tests not intended to support effectiveness estimates
 - Open flame testing of nine material combinations
 - Important factors identified: standard test materials, mockup geometry
- Staff plans to continue assessing large scale testing as a tool to evaluate effectiveness of a standard

Key Features of CPSC Staff's Current Draft Standard

- Tests to evaluate both smoldering and open flame ignitability
- Bench scale performance tests reflecting the interaction of seating area materials in composite assemblies, using standard test materials (cover fabric, resilient foam and loose filling)
- Test methods & apparatus similar to Calif., U.K., ASTM/UFAC
- Compliance options (e.g., fire barriers, as-built composites) to reduce costs and preserve consumer choices

Draft Smoldering Resistance Test Method

- Modified (3" thick) ASTM / UFAC mock-up with standard materials
- Standard cigarette ignition source
- Applies to cover fabrics, filling materials and barriers
- 30 minute test duration
- Maximum 10% post-test filling material mass loss

CPSC Staff Revised Draft Standard

Mockup & Ignition Source for Smoldering Tests



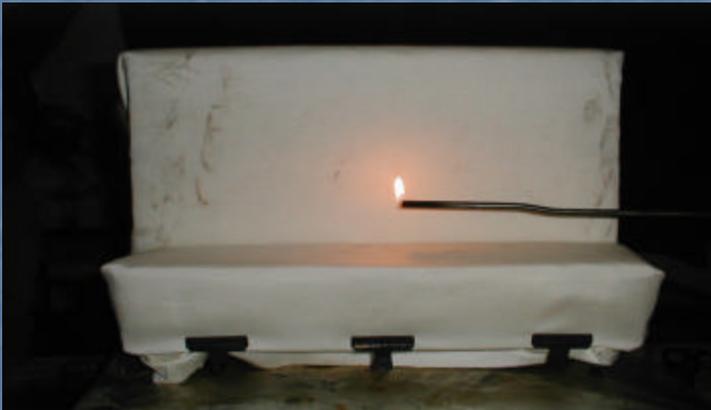
Cover fabrics, filling materials & fire barriers

Draft Open Flame Resistance Test Method

- BS 5852 seating mock-up
- Nominal 35 mm/20 sec gas flame for filling materials & cover fire barriers
- Nominal 240 mm/70 sec. for interior fire barriers
- 45 minute test duration
- Maximum 20% post-test mockup mass loss

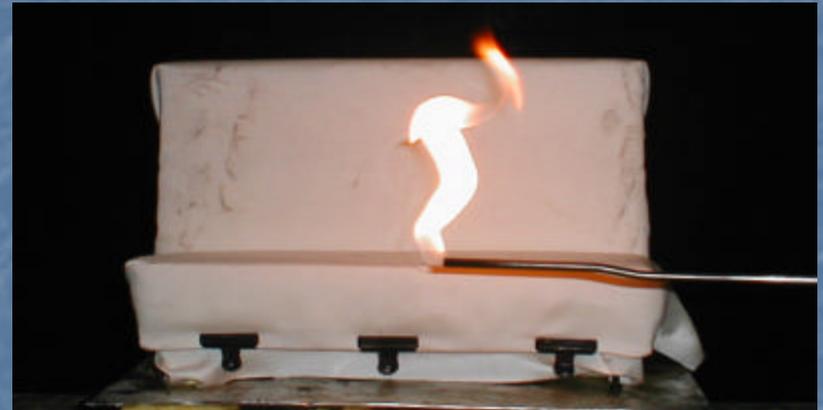
CPSC Staff 2005 Revised Draft Standard

Open Flame Test Ignition Sources



Nominal 35 mm flame, 20 sec.

Filling materials &
Cover fire barriers



Nominal 240 mm flame, 70 sec.

Interior fire barriers

Materials Covered by CPSC Staff's Current Draft Standard

- Cover fabrics
- Filling materials
 - Resilient cellular – chiefly urethane foam
 - Fibrous – chiefly polyester or cotton batting / cushion wraps
 - Loose fillings – chiefly polyester fiber fill
- Fire barriers
 - Cover barriers – used with non-complying fillings
 - Interior barriers - used with both non-complying cover fabrics and non-complying fillings

Cover Fabric Test

- Smoldering resistance
- About 10% of existing fabrics expected to fail
- Options: reformulate (e.g., fiber content), FR treatment, or furniture constructed with barrier

Filling Materials Tests

- Smoldering & open flame resistance
- Effect of foam requirements similar to 2002 revised draft "TB-117+;" fibrous & loose filling requirements less stringent
- Most non-FR filling materials would fail open flame tests
- Options: FR treatments, or furniture constructed with barrier

Fire Barrier Tests

- Smoldering & open flame resistance
- Cover barriers – qualified for use with non-complying fillings
 - Already used in about 30% of furniture
 - Leather, wool, vinyl, some FR cover fabrics
- Interior barriers - qualified for use with both non-complying cover fabrics and non-complying fillings
 - Projected for use in about 4% of furniture
 - High-loft batting or FR interior fabrics

Draft Requirements by Type of Furniture

Performance Test	Type I Interior Barrier	Type II Cover Barrier	Type III Specified Materials	Type IV End Product Materials
Cover Fabric – Smoldering		X	X	
Filling Materials – Smoldering			X X X*	
Interior Barrier – Smoldering	X			
End Product Mat'ls – Smoldering				X
Filling Materials – Open Flame			X X X*	
Cover Barrier – Open Flame		X		
Interior Barrier – Open Flame	X			
End Product Mat'ls – Open Flame				X

*There are Type III filling materials tests for resilient, fibrous and loose fillings; for loose fillings, manufacturer elects to comply as either Type III (loose filling test without interliner) or Type III-B (loose filling interliner test with standard loose filling)

Products Covered by Staff's Current Draft Standard

- Residential interior seating furniture with contiguous upholstered seat & back:
 - Home office furniture
 - Dormitory furniture
- Excludes other products, such as:
 - Ottomans, pillows, many office / dining chairs
 - Commercial / contract / hotel – lodging furniture not intended or sold for residential use
 - Futons, flip chairs, sleep sofa mattresses, other items covered under mattress standard

Other Draft Requirements for Manufacturers & Importers

- Final product labeling: Manufacturer / importer identification, compliance method
- Statement of compliance supported by tests, guaranties or other objective basis
- Recordkeeping for each product / material demonstrating compliance
- Effective date: to be determined

Preliminary Regulatory Analysis

- Estimation of benefits & costs
- Sensitivity analysis of varying parameters
- Comparative assessment of significant regulatory alternatives

Cost / Benefit Analysis

- **Benefits = Reductions in societal costs associated with deaths, injuries & property losses prevented by a standard**
- **Costs = total resource costs for labor, materials, testing, recordkeeping, and compliance efforts**
- **Net benefits = benefits - costs**

Estimated Benefits

(per unit of complying furniture)

- Expected present value of benefits over the projected useful life of an article of furniture
- Range of benefits:
 - \$10 per unit with less ignitable cover fabrics
 - \$166 per unit with most ignitable cover fabrics

Estimated Costs

(per unit of complying furniture)

Range of resource costs, depending on compliance method

- \$7 per unit produced with FR filling materials only (about 60% of units)
- \$14-19 per unit produced with FR fabrics & fillings (about 6% of units)
- \$18-24 per unit with interior barriers (about 4% of units)
- Negligible costs for units produced with ignition resistant cover materials (leather, vinyl, etc., about 30% of units)

Benefit / Cost Summary for CPSC Staff's Current Draft Standard

- Net benefits = Benefits - Costs
= \$936 mil. - \$184 mil.
= \$752 mil.
- Includes an estimated 220 deaths averted over the expected life of a year's complying production

Sensitivity Analysis

- **Assesses the effect of varying parameters in the regulatory analysis**
 - Discount rate (in estimating present value of lifetime benefits)
 - Value of statistical life
 - Estimates of resource costs
 - Estimates of effectiveness
- **Conclusion: standard would still have substantial net benefits**

Analysis of Regulatory Alternatives: 2001 CPSC Staff Draft Open Flame Standard

- Virtually all furniture made with FR fabrics (excluding leather, etc.) or barriers
- Non-FR filling materials
- Net benefits about the same as staff's current draft, but at much higher cost

Analysis of Regulatory Alternatives: 2004 Industry Proposal

- Light FR for many cover fabrics; unspecified barrier option
- FR foam, modified (non-FR) polyester batting
- The most smolder-prone fabrics would not be FR
- Lower costs, but net benefits much lower than staff's current draft

Analysis of Regulatory Alternatives: 2002 Revised Draft Cal 'TB-117+'

- FR for most cover fabrics; no barrier option
- FR foam and other filling materials
- Gross benefits similar to CPSC staff's current draft, but costs twice as high
- Net benefits somewhat lower than staff's current draft

Analysis of Regulatory Alternatives: Current Staff Draft Smoldering Ignition Requirements Only

- FR fillings would not be required
- Substantially reduced smoldering and open flame benefits
- Costs reduced by over \$130 million; benefits reduced by over \$500 million
- Net benefits substantially lower than staff's current draft

Analysis of Regulatory Alternatives: Current Staff Draft Without Loose Fill Open Flame Requirements

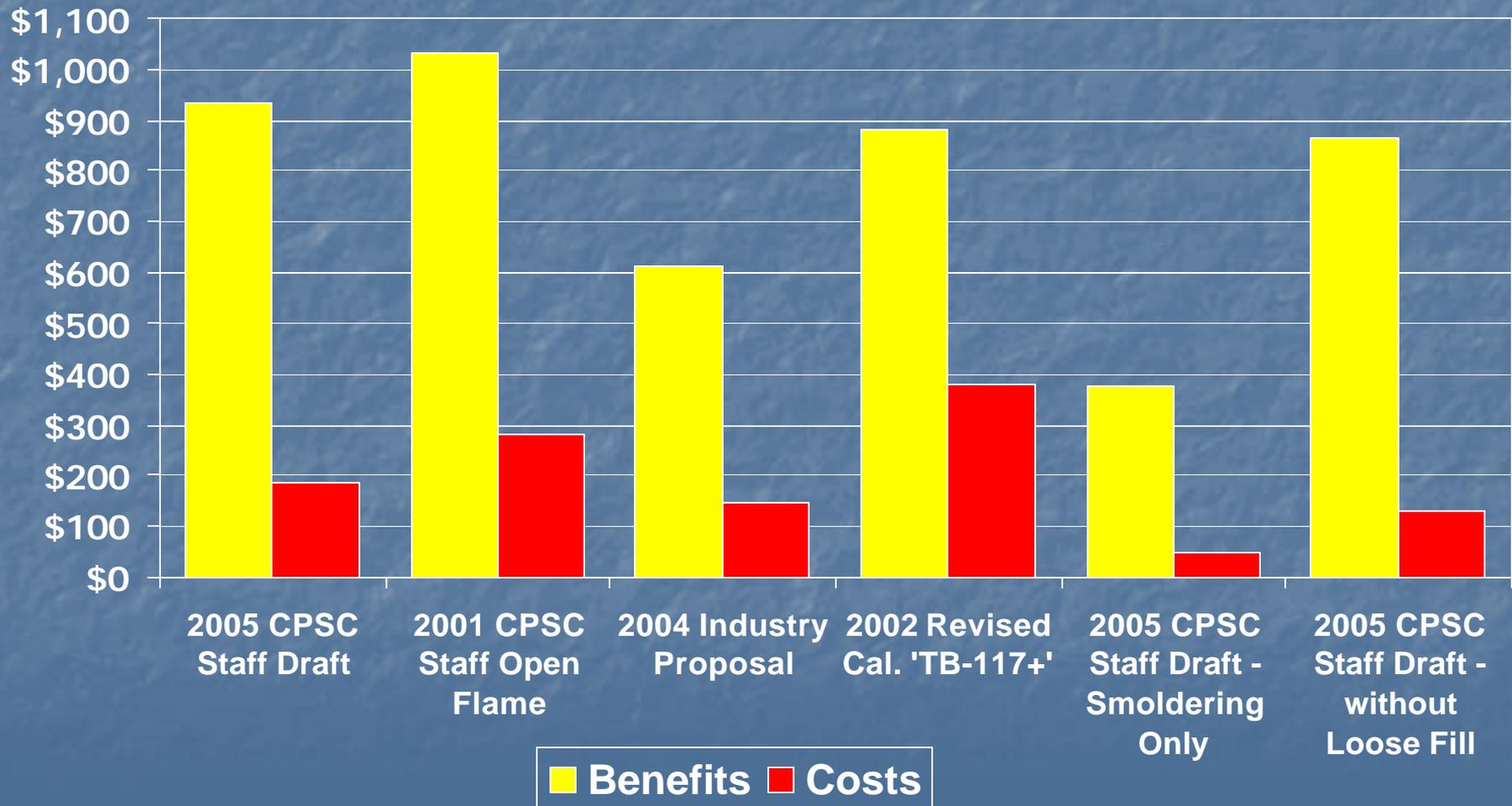
- FR loose fillings or interliners would not be required
- Costs reduced by about \$55 million, benefits reduced by about \$70 million
- Net benefits marginally lower than staff's current draft

Analysis of Regulatory Alternatives: Current Staff Draft With Open Flame Fabric Test Added

- FR fabrics would be required
- Costs increased by about \$100 million
- FR filling materials would already provide some open flame benefits under staff's current draft
- Net benefits uncertain but probably lower than under staff's current draft

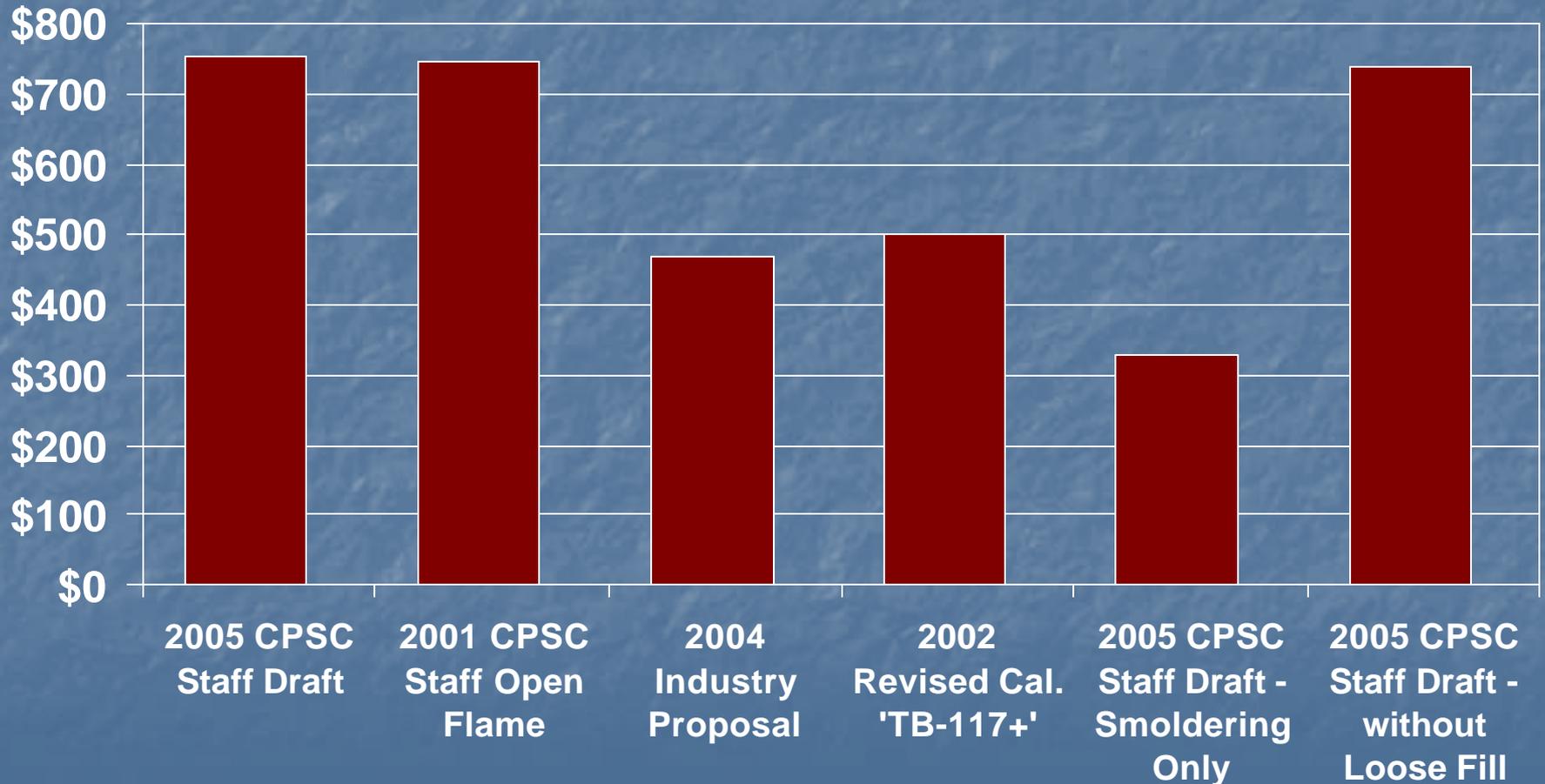
Benefits & Costs of Various Alternatives

(\$million per year's complying production)



Net Benefits of Various Alternatives

(\$million per year's complying production)



Small Business Impacts

- Initial regulatory flexibility analysis required under Regulatory Flexibility Act
 - Identify impacts on small entities
 - Consider alternatives to reduce impacts
- Nearly all affected firms are small businesses
- CPSC staff's current draft standard designed to minimize potential impacts:
 - Uses material tests instead of finished product tests
 - Provides compliance options, e.g., barriers
 - Does not require production testing
- Per-unit manufacturing costs expected to be similar for larger and smaller firms

Flame Retardant Chemicals

- CPSC staff's objective: reduce fire risk without imposing chemical risks
- Commission public hearing 1998
- EPA cooperative efforts since 1998
- National Academy of Sciences study 2000
- CPSC staff request for National Toxicology Program review 2006

Flame Retardant Chemicals

(continued)

- FR filling material use a likely means of compliance with staff's current draft standard or most alternatives
- Relatively little reliance on FR cover fabrics to meet staff's current draft
- FR fabrics would be used, to varying degrees, to meet 2001 staff draft, 2004 industry proposal or 2002 revised Calif. draft 'TB-117+'

Flame Retardant Chemical Research

- CPSC staff risk assessment of major filling material FRs
- CPSC staff risk assessment of selected mattress barrier FRs
- EPA Significant New Use Rules, Design for the Environment furniture program
- CPSC staff environmental assessment

FR Chemical Preliminary Risk Assessment

- Health risks under FHSA based on risk, i.e., toxicity, exposure & bioavailability
- Two major filling material FRs evaluated:
 - Proprietary brominated aryl ester / aromatic phosphate blend
 - Tris (1,3-dichloropropyl-2) phosphate (TDCP)
- Based on limited toxicity and exposure data:
 - BAE/AP blend Hazard Index < 1.0: appreciable health risk from furniture use unlikely
 - TDCP HI around 1.0; LADD/cancer potency > 1 / mil: exceeds health risk levels relevant for regulatory consideration; additional testing needed to confirm

FR Chemical Preliminary Risk Assessment

(continued)

- **Alternative foam treatments**
 - Melamine – not 'toxic' under the FHSA
 - Other proprietary formulations reviewed by EPA / Design for the Environment program
- **Preliminary conclusion: foam FRs are available that would not pose appreciable health risks**

Fire Barrier FRs

- CPSC staff assessment of selected mattress barrier FRs:
 - Antimony trioxide
 - Boric acid
 - Decabromodiphenyl oxide
 - Vinylidene chloride
 - Ammonium polyphosphate
 - Melamine
- Conclusion: FR mattress barriers are available that would not pose appreciable health risks
- Conclusions likely to apply to furniture barriers

FR Chemicals: EPA Activities

- EPA has primary responsibility for regulating chemical risks, with several ongoing activities related to FRs
- 2004: proposed Significant New Use Rule for selected PBDE compounds; requires reporting by manufacturers, triggers EPA review
- 2004: reviewed proprietary BAE / AP blend under New Chemicals program; no restrictions imposed
- 2004-2005: Design for the Environment furniture industry partnership program to identify and develop more environmentally preferable filling material FRs
- Draft SNUR for FRs used in upholstered furniture, could accompany proposed CPSC rule

Environmental Assessment

- Required under NEPA for proposed rules
- No FRs would be specified or required by a CPSC flammability performance standard
- FRs may be used in fabrics, fillings or barriers, to varying degrees, under different alternatives
- FR foam fillings widely used to meet Calif. TB-117; FR cotton batting widely used to meet UFAC voluntary guidelines and 16 CFR 1632 (mattresses); FR fabrics widely used to meet U.K. regulations

Environmental Assessment

(continued)

- Estimated 3-7% increase in FR usage to meet CPSC staff's 2005 revised draft; probably similar under 2001 staff draft, higher under 2002 revised 'TB-117+,' lower under smoldering-only or no-loose-fill options
- In view of small likely increase, ongoing industry research & development of new FRs, and available regulatory mechanisms, a CPSC proposed rule would likely not have significant adverse environmental impacts (including health impacts)
- Possible Finding of No Significant Impact (FONSI) following peer review of risk assessment report

Preliminary Conclusions

- A proposed flammability rule could effectively address the risk from both smoldering cigarette and small open flame ignition of upholstered furniture
- Several regulatory alternatives would have substantial net benefits to the public
- Increased fire safety can be achieved without posing appreciable chemical-related health or environmental risks

Next Steps

- Complete peer reviews of technical documents per OMB bulletin
- Continue technical research: standard test materials evaluation, large scale testing
- Continue working with stakeholders on technical issues; develop responses to public comments
- Continue cooperation with EPA on FR chemical issues
- Staff briefing package for Commission consideration of possible NPR

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For further information contact
Dale Ray, Project Manager
301-504-7704 <dray@cpsc.gov>