DecaBDE and NPE
Alternatives Analysis Pilot Project

March 2014
Agenda

• Introductions
• Pilot AAs
  – Cases
    • DecaBDE/computer housings
    • NPE/general purpose surfactants
  – Timeline
  – High level DecaBDE report review
  – Comment period on pilot reports
Alternatives Analysis Pilot Project

**Purpose:** Gain useful experience to inform public comments on SCP regs and guidance documents by completing an Alternatives Analysis that meets requirements of Article 5

--- NOT LEGAL ADVICE ---
Selected BizNGO Cases: Criteria for Selecting Cases

• Two types of products: formulated product and article
• Different environmental/human health concerns
• Cases with available data
  – US EPA DfE AAs: DecaBDE and NPE
    • Note: these are hazard assessments only
• Cases with successful substitutions
  – Viable alternatives on the market and in use by companies
• Demonstrate what’s possible when data are rich
• Process focused (rather than content)
DecaBDE

Priority Product / Chemical of Concern

– Electronics enclosures containing decaBDE

– “Electronics enclosures” defined as the external housings of electronic products

– An Alternatives Analysis Threshold of 0.01%wt applies to the homogenous plastic material(s) comprising the enclosure
  
  • Addresses recycled content with decaBDE

– Choice of decaBDE allowed team to draw from substantial existing work, including EPA and WA state

– DecaBDE is already restricted under EU RoHS
NPE

Priority Product / Chemical of Concern

– All-purpose cleaners containing Nonylphenol Ethoxylates (NPE)

– “All-purpose cleaner” defined as one that works on multiple surfaces and accomplish many types of basic soil removal needs

– *No Alternatives Analysis Threshold selected for this pilot*

– Choice of NPE allowed team to draw from substantial existing work, including EPA
DecaBDE and NPE AAs

DecaBDE
Chairs: Cheri Peele and Cory Robertson

- Multistakeholder team
- Used SCP structure and timeline
- Functional use: flame retardant
- Is it necessary: yes, legal

- Key impact areas: life cycle breakdown products, PBT
- Life cycle concerns: environmental fate, burning of e-waste (dioxins)

NPE
Author: Eric Harrington

- Individual consultant
- Used single report structure
- Functional use: surfactant
- Is it necessary: yes, basic functionality of all-purpose cleaners

- Key impact areas: aquatic tox, endocrine, skin/eye, irritant
- Lifecycle concerns: environmental fate, degrades to NP (vPvB)
Stage 1 Alternatives Analysis Timeline

From: Lynn Goldman’s presentation to the Green Ribbon Science Panel on 29 January 2014
DecaBDE Pilot Timeline

July 15, 2012 - Start of project
• Creation of a mock “notice” from DTSC

Jan 11, 2013 – Phase 1 due date
• 180 days to submit to “department”
• Submitted Dec 1, 2012 (early)

Feb 12, 2013 – “department” review
• 60 days from submission for “department” response (late)
• Got the equivalent of a “notice of deficiency”
  [challenging to correct Preliminary in 60d, as the process required, because regs were open for comment and had changed]

Note: AA portion only (not other notifications)
DecaBDE Pilot Timeline

March-April 2013
• Preliminary AA Report reformatted to new requirements
• Addressed comments from mock “department”
• Started Stage 2
• Continue to adjust Stage 1

July 2013
• Share interim findings and observations with DTSC

March 2014
• New working deadline for Phase 2 (Final AA Report)
• Posted final draft for submission to the “department”

Note: AA portion only (not other notifications)

Pilot was able to meet timelines
SCP ARTICLE 5
If a Chemical of Concern is in a Priority Product:

- Alternatives assessment may be required
  
  - Highly prescribed analysis and documentation (Article 5)

- Assessment occurs BEFORE regulatory action

- Each “responsible entity” has to respond independently (like permit process)

- Can use consortia for the technical portion of AA
First Stage of Alternatives Analysis

**Step 1**
ID Product Requirements
- Function, performance, standards & legal requirements
- Function of Chemical of Concern
- Is the chemical necessary?
- Is replacement chemical necessary?

**Step 2**
ID* Alternatives
- Meet product requirements
- Reduce / eliminate CC
- Reduce / eliminate exposure
- Look at existing alternatives

*Should ID chemical substitutes AND other alternatives.

**Step 3**
ID relevant factors
- Determine relevant hazards
- Compare alternatives
- Eliminate replacements with greater adverse impacts

**Step 4**
Prepare Report
- Preliminary AA report
  - 180 days
  - Work plan for 2nd Stage of AA process

From: Lynn Goldman’s presentation to the Green Ribbon Science Panel on 29 January 2014
Second Stage of Alternatives Analysis

**Step 1 – ID Relevant Comparison Factors**
- In conjunction with exposure pathways & lifecycle phases
- Quantitative / qualitative analysis
- Available information

**Step 2 – Compare Priority Product & Alternatives**
- Quantitative / qualitative analysis
- Relevant factors
  - exposure pathways
  - life cycle segments
- Available information

**Step 3 – Alternatives Selection Decision**
- Final AA Report
  - 1 year
  - Reason & justification for decision

From: Lynn Goldman’s presentation to the Green Ribbon Science Panel on 29 January 2014
DECA REPORT
**First Stage of Alternatives Analysis**

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- Preliminary AA report
- 180 days
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*Should ID chemical substitutes AND other alternatives.

From: Lynn Goldman’s presentation to the Green Ribbon Science Panel on 29 January 2014
Stage 1 -> Preliminary AA Report

Preliminary AA Report content is pre-defined in 69505.7:

(b) Executive Summary
(c) Preparer Info
(d) Responsible Entity Info
(e) Priority Product Info
(f) Relevant Factors
(g) Comparison of Alternatives
(h) Methodology/Tools
(i) Supporting Info
(j) Selected Alternative(s)
(k) Next Steps
Stage 1 -> Preliminary AA Report

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    ACRONYMS & ABBREVIATIONS.................................................................................................................................
(b) EXECUTIVE SUMMARY ........................................................................................................................................

(e) 1. Priority Product Information............................................................................................................................
    1.1 Functional Requirements....................................................................................................................................
    1.2 Performance Requirements..............................................................................................................................
    1.3 Legal Requirements............................................................................................................................................
    1.4 Role of Chemical of Concern in Meeting Product Requirements....................................................................

2. Scope and Comparison of Alternatives..................................................................................................................
    2.1 Identification of Alternatives..............................................................................................................................

(f) 2.2: Identification of Relevant Comparison Factors................................................................................................

(g) 2.3 Preliminary Evaluation and Screening of Alternative Replacement Chemicals

(h) 2.4 Additional Information......................................................................................................................................

(j) 3. Selected Alternative(s)........................................................................................................................................

(k) 4. Final Alternatives Assessment Work Plan and Proposed Implementation Schedule,
    Second Stage..............................................................................................................................................................

    1. Multimedia Life Cycle Assessment..................................................................................................................
    2. Product Function & Performance........................................................................................................................
    3. Economic Impact..................................................................................................................................................

Appendix A: Administrative Compliance....................................................................................................................

(i) References ...............................................................................................................................................................
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Appendix A: Administrative Compliance

References ...............................................................................................................................
Stage 1 -> Preliminary AA Report

Priority Product Information (e)
• Functional requirements
• Performance requirements
• Legal requirements
• Role of chemical (is it necessary?)

-- Relatively easy --
Stage 1 -> Preliminary AA Report

Identification of Alternatives
• Large number of alternatives (>100)
• Removed many from consideration
• 20 retained
• Documented reasons

-- Relatively easy --
Stage 1 -> Preliminary AA Report

Identification of Relevant Factors
• Large number of factors
• Unclear how to substantiate decisions

-- Relatively hard --
Relevant Factors Analyzed Only

A factor is relevant if:
- There is an exposure pathway in a particular life cycle segment
- The factor makes a material contribution to one or more adverse impact areas
- There is a material difference in the factor’s impact between alternatives

GOOD = Don’t have to reconsider Stage 1 factors in Stage 2
BAD = Burden of proof for relevance UNCLEAR
Expanded List of Human Health and Environmental Areas for Stage 1 Screening (80 factors)

FOR DEMONSTRATION ONLY. NOT FOR COMPLIANCE PURPOSES.

80 factors x 12 life cycle segments = 960 combinations
Stage 1 -> Preliminary AA Report

Identification of Relevant Factors
- Large number of factors
- Unclear how to substantiate decisions

USED GreenScreen/DfE Human Health and Eco Factors and Life Cycle Thinking
## Stage 1 Summary Matrix

### Table 3: Alternatives to Deca-BDE in Electronic Enclosures Summary Table

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>DecaBDE</td>
<td>$L^9$</td>
<td></td>
<td>$H_{B,C,E}$</td>
<td>$L$</td>
<td>$M$</td>
<td>$L$</td>
<td>$M$</td>
<td>$D$</td>
<td>$A,D,B,C,D,F$</td>
<td>$A,D,B,C,D,F$</td>
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<td>Monomeric N-alkoxy hindered amine</td>
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<td>$L$</td>
<td>$D$</td>
<td>$L$</td>
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<td>$A,D,B,C,D,F$</td>
<td>$A,D,B,C,D,F$</td>
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<tr>
<td>Polyphosphonate oligomers</td>
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<td>$L$</td>
<td>$D$</td>
<td>$L$</td>
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<td>$A,D,B,C,D,F$</td>
<td>$A,D,B,C,D,F$</td>
</tr>
<tr>
<td>APP Ammonium Polyphosphate</td>
<td>$M_{A,B,D,E,F}$</td>
<td>$H_F$</td>
<td>$L$</td>
<td>$M$</td>
<td>$L$</td>
<td>$D$</td>
<td>$L$</td>
<td>$A,D,B,C,D,F$</td>
<td>$A,D,B,C,D,F$</td>
<td>$A,D,B,C,D,F$</td>
</tr>
<tr>
<td>ATH - Aluminium tri-hydroxide</td>
<td>$H_{A,B,D,E,F}$</td>
<td>$H_{B,C,E}$</td>
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<td>$M$</td>
<td>$L$</td>
<td>$D$</td>
<td>$L$</td>
<td>$A,D,B,C,D,F$</td>
<td>$A,D,B,C,D,F$</td>
<td>$A,D,B,C,D,F$</td>
</tr>
<tr>
<td>Diethylphosphate, aluminium salt</td>
<td>$H_{A,B,D,E,F}$</td>
<td>$H_F$</td>
<td>$L$</td>
<td>$M$</td>
<td>$L$</td>
<td>$D$</td>
<td>$L$</td>
<td>$A,D,B,C,D,F$</td>
<td>$A,D,B,C,D,F$</td>
<td>$A,D,B,C,D,F$</td>
</tr>
<tr>
<td>MDH - Magnesium di-hydroxide</td>
<td>$H_{A,B,D,E,F}$</td>
<td>$H_{B,C,E}$</td>
<td>$M_{X}$</td>
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<td>$L$</td>
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<td>$A,D,B,C,D,F$</td>
<td>$A,D,B,C,D,F$</td>
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<tr>
<td>Melamine Cyanurate</td>
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<td>$H_B$</td>
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<td>$D$</td>
<td>$L$</td>
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<td>Melamine Polyphosphate</td>
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<td>$L$</td>
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<td>$L$</td>
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<td>$A,D,B,C,D,F$</td>
<td>$A,D,B,C,D,F$</td>
</tr>
<tr>
<td>P/N based intumescent systems</td>
<td>$M_{A,B,D,E,F}$</td>
<td>$H_F$</td>
<td>$L$</td>
<td>$M$</td>
<td>$L$</td>
<td>$D$</td>
<td>$L$</td>
<td>$A,D,B,C,D,F$</td>
<td>$A,D,B,C,D,F$</td>
<td>$A,D,B,C,D,F$</td>
</tr>
<tr>
<td>Polycarbonate-Polyphosphonate</td>
<td>$M_{A,B,D,E,F}$</td>
<td>$H_B$</td>
<td>$L$</td>
<td>$M$</td>
<td>$L$</td>
<td>$D$</td>
<td>$L$</td>
<td>$A,D,B,C,D,F$</td>
<td>$A,D,B,C,D,F$</td>
<td>$A,D,B,C,D,F$</td>
</tr>
<tr>
<td>RDP Resorcinol bis (diphenyl</td>
<td>$M_{A,B,D,E,F}$</td>
<td>$H_F$</td>
<td>$L$</td>
<td>$M$</td>
<td>$L$</td>
<td>$D$</td>
<td>$L$</td>
<td>$A,D,B,C,D,F$</td>
<td>$A,D,B,C,D,F$</td>
<td>$A,D,B,C,D,F$</td>
</tr>
<tr>
<td>TPP - triphenyl phosphate</td>
<td>$M_{A,B,D,E,F}$</td>
<td>$H_F$</td>
<td>$L$</td>
<td>$M$</td>
<td>$L$</td>
<td>$D$</td>
<td>$L$</td>
<td>$A,D,B,C,D,F$</td>
<td>$A,D,B,C,D,F$</td>
<td>$A,D,B,C,D,F$</td>
</tr>
<tr>
<td>Aluminum housing material</td>
<td>$H_{A,B,D,E,F}$</td>
<td>$H_{B,C,E}$</td>
<td>$H_{X}$</td>
<td>$L$</td>
<td>$L$</td>
<td>$D$</td>
<td>$L$</td>
<td>$L$</td>
<td>$L$</td>
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</tr>
</tbody>
</table>

### Legend:

- **A** Adverse Environmental Impacts
- **B** Adverse Public Health Impact
- **C** Adverse Waste and End-of-Life Effects
- **D** Environmental Fate
- **E** Materials and Resource Consumption Impacts
- **F** Physical Chemical Hazards
- **X** Physical-chemical Properties

**Bold font** indicates empirical data.

**Italic font** indicates lower confidence estimate based professional judgment.

*Energy-Alternative may result in higher energy consumption. Depending on the energy source there may be impacts in areas A through F.*
Stage 1 -> Preliminary AA Report

Work Plan and Next Steps
• Nebulous instructions
• Needs to be a fairly detailed plan of planned analyses and tools for Stage 2
Second Stage of Alternatives Analysis

**Step 1 – ID Relevant Comparison Factors**
- In conjunction with exposure pathways & lifecycle phases
- Quantitative / qualitative analysis
- Available information

**Step 2 – Compare Priority Product & Alternatives**
- Quantitative / qualitative analysis
- Relevant factors
  - exposure pathways
  - life cycle segments
- Available information

**Step 3 – Alternatives Selection Decision**
- Final AA Report
  - 1 year
  - Reason & justification for decision

From: Lynn Goldman’s presentation to the Green Ribbon Science Panel on 29 January 2014
Stage 2 -> Final AA Report

For this pilot:

Preliminary + Stage 2 = Final

Second Stage Analysis:

1. Multimedia Life Cycle Assessment
   Completion: 20 weeks after approval of Phase 1 AA
   Output: Potential alternatives associated with significant module will be removed from further consideration.

2. Product Function & Performance
   Completion: 29 weeks after approval of Phase 1 AA
   Output: Potential alternatives will be identified that are not viable in the market.

3. Economic Impact
   Completion: 29 weeks after approval of Phase 1 AA
   Output: Potential alternatives associated with significant module will be removed from further consideration.
Work Plan for Stage 2

Second Stage Analysis:

1. Multimedia Life Cycle Assessment
   Completion: 20 weeks after approval of Phase 1 AA
   Output: Potential alternatives associated with significant burden shifting after evaluation using the life cycle thinking module will be removed from further consideration.

   Used Screening LCA to identify hotspots
   Estimated impacts for alternatives
2. Product Function & Performance

Completion: 29 weeks after approval of Phase 1 AA

Output: Potential alternatives will be identified that are expected to meet safety and performance standards.

Used material properties and finite element modeling to estimate performance impacts
Work Plan for Stage 2

3. Economic Impact
Completion: 29 weeks after approval of Phase 1 AA
Output: Potential alternatives associated with significant burden shifting will be removed from further consideration.

Used a previous analysis conducted by Washington State Department of Ecology as source for data and methods

-- DEEPLY PROBLEMATIC--
NO DATA SOURCES
NO METHODS
DecaBDE Pilot Observations

- **Stage 1 was more manageable, tools are available**
  - Unclear how to substantiate “relevance” determination
  - Unclear how much analysis will be considered sufficient
  - Unclear how to handle data gaps

- **Stage 2 was harder, larger scope, fewer tools**
  - Meaningful economic analysis may not be possible in some cases
NPE Report Also Available

Priority Product / Chemical of Concern

– All-purpose cleaners containing Nonylphenol Ethoxylates (NPE)

– Presents complete GreenScreen assessments (not just hazard summary tables)

– **Some key observations:**
  
  • Data gaps for alternatives
  
  • No efficacy standard
  
  • No economic data
  
  • No direct life cycle data
How to Comment on Reports

Preliminary and Final AA Reports available for public comment at BizNGO web site [http://www.bizngo.org](http://www.bizngo.org)

Deadline March 26

Although WE are not providing legal guidance on whether these reports comply with the regulations, COMMENTERS are welcome to provide their opinions on compliance.
THANK YOU
Complexity vs Parsimony*

Maximalist

- Large number of factors
- Desire to be thorough and make high confidence decision
- Conclusions need to withstand scrutiny and peer review
- Need to defend against single issue criticism/activism
- Need to meet statutory requirements
- Maximum employment for consultants

Parsimonious

- Large number of factors can result in less differentiation between options
- Less differentiation increases chance of cognitive bias in decision making
- Resource and time constraints
- Perfect model doesn’t exist
- Maximum analyses can still result in unforeseen consequences

*Principle of “parsimony” – the ideal of explaining phenomena using fewer parameters