Logistics

Please state your name and organization in the chat box for the purposes of recording meeting attendance.

We will pause for opportunities for attendee participation at designated times.

Recordings of a public committee are not permitted without notifying the chair in advance so that attendees can be notified at the beginning of the meeting.

Written notes are being taken.

Please contact Caroline.Higley2@mass.gov if you have technical difficulties during the meeting.
Use Zoom function to raise your hand for comments or questions.

- To access the "Raise Hand" function, click "Participants" at the bottom of your screen, and then click the "Raise Hand" button that appears under the list of participants.
- This will notify the host that you have a question.
- Participants will be unmuted and invited to ask questions one at a time.
Today’s Agenda

1. Welcome and Council Member Introductions
2. Approval of September 10, 2020 meeting minutes
3. PFAS Policy Analysis Presentation
4. TURA Program role in An Act to Protect Children, Families and Firefighters from Harmful Flame Retardants
5. Ad Hoc Committee Update
6. Nanomaterials Update
7. TURA Program Update
8. Adjourn

Note: Public comments/questions will be held until opened for general discussion
Per- and Poly-fluoroalkyl Substances (PFAS): Overview of Policy Analysis

March 2021
Toxics Use Reduction Institute
Policy Analysis Overview

• Analyzes the implications of adding a substance category, Per- and Poly-Fluoroalkyl Substances, Not Otherwise Listed (PFAS NOL)

• With this addition, businesses in TURA covered sectors meeting relevant thresholds would be subject to TURA reporting, planning and fees

• Based on a thorough review of the Science Advisory Board’s recommendation and policy implications, TURI recommends that the PFAS NOL category be added to the TURA List
## PFAS Policy Analysis

- Explains the definition of the proposed category
- Summary of the Science
- Use information
- Opportunities for toxics use reduction
- Regulatory context
- Implications for the TURA program
Recommendation (pp. 1 & 2)

The TURA Science Advisory Board (SAB) has recommended adding the category *Per- and Poly- Fluoroalkyl Substances Not Otherwise Listed (PFAS NOL)*, to the TURA list of Toxic or Hazardous Substances (TURA List). The category would be defined as follows:

- those PFAS that contain a perfluoroalkyl moiety with three or more carbons (e.g., $-\text{C}_n\text{F}_{2n}-$, $n \geq 3$; or $\text{CF}_3-\text{C}_n\text{F}_{2n}-$, $n \geq 2$) or a perfluoroalkylether moiety with two or more carbons (e.g., $-\text{C}_n\text{F}_{2n}\text{OC}_m\text{F}_{2m}-$ or $-\text{C}_n\text{F}_{2n}\text{OC}_m\text{F}_m-$, $n$ and $m \geq 1$), that are not otherwise listed.

Based on a thorough review of the information summarized in this policy analysis, the Toxics Use Reduction Institute recommends that this category be added to the TURA list.
Approach to PFAS in MA (p. 3)

Drinking water
In 2020, MassDEP adopted an MCL of 20 parts per trillion (ppt) for six PFAS combined.
MassDEP is also offering free PFAS sampling to all public water supplies (PWS), and partnering with UMass Amherst to conduct sampling of private wells around the state.

Waste Sites
Some PFAS are considered to be "hazardous material" subject to the notification, assessment and cleanup requirements of the Massachusetts Waste Site Cleanup Program.
In 2019, MassDEP adopted a standard of 20 ppt for six PFAS combined for groundwater cleanup in areas where groundwater is a current or potential drinking water supply.

WWTP Sampling
MassDEP has begun a sampling program at wastewater treatment facilities to test for the presence of PFAS and to further locate upstream sources.
MassDEP and MA Department of Public Health (DPH) are working with impacted communities to help residents understand their exposure to PFAS and potential health effects.

MA DPH is providing information to clinicians about medical care needs and answering questions from community members about their exposure and risk.

MassDEP has initiated a grant program to assist public water supplies as they address PFAS contamination.
Hierarchy of Controls

1. **Elimination**
   - Physically remove the hazard
     - Eliminate need for PFAS functionality (e.g., switch to trivalent Cr to eliminate need for fume suppressants, carpet fibers that are inherently stain resistant)

2. **Substitution**
   - Replace the hazard
     - Material or chemical substitution (e.g., fluorine-free fire fighting foams, safer non-fluorinated polymers and surfactants)

3. **Engineering Controls**
   - Isolate people from the hazard
     - Closed loop processing equipment and circular economy to prevent exposure, emissions and waste

4. **Administrative Controls**
   - Change the way people work
     - Treatment, emissions control and best practices in manufacturing facilities; end of life management for products

5. **PPE**
   - Protect the worker
     - Prevent worker exposure using personal protective equipment; prevent exposure to public/biota once PFAS contamination exists

6. **Mitigation**
   - Repair the damage
     - Mitigation: remediation of environment, biomonitoring, treatment of disease

The diagram indicates a hierarchy with Elimination being the most effective and Mitigation being the least effective.
Background on PFAS (p. 5)

Perfluorooalkyl and per- and polyfluorinated alkyl ether acids (PFAAs) are a subset of PFASs. Other PFASs include PFAA precursors.

Also see Appendix A for details/examples.
To understand the characteristics of a range of PFAAs, the SAB examined eight substances of varying chain lengths: PFNA (C9); PFOS and PFOA (C8); PFHpA (C7); PFHxA and PFHxS (C6); and PFBA and PFBS (C4).

The SAB then reviewed two ethers (GenX and ADONA), and phosphonic and phosphinic acids (PFPA and PFPiAs) of varying chain lengths.

The SAB reviewed various health impacts as well as a number of degradation/transformation pathways, through which a PFAS precursor breaks down into one of the end degradation products.
# Table 1: Chronic Health Effects (p. 10)

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**Note:** The SAB did not conduct a literature review for PFOS and PFOA due to the volume of information available through authoritative bodies and large scale epidemiological studies. Therefore, the endpoints shown for PFOA are not identical to those shown for the other chemicals, and are primarily the Board's review of the C8 Health Study. For PFOS, the only endpoint noted is from the Board's review of an NTP immunotoxicity study on PFOS and PFOA, although there is a significant body of evidence for many other chronic health effects.

* Pregnancy Induced Hypertension
### Table 2: Persistence, presence in the environment, & bioaccumulation (p. 10)

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**Notes:**
- Information on these chemical properties is drawn from peer reviewed studies and from US or EU and other government documents.
- PFOS and its salts and perfluorooctyl sulfonyle fluoride as well as PFOA, its salts, and PFOA-related compounds are designated as Persistent Organic Pollutants under the Stockholm Convention. For up to date information as of December 2019, see: [http://chm.pops.int/TheConvention/Overview/TextoftheConvention/tabid/2232/Default.aspx](http://chm.pops.int/TheConvention/Overview/TextoftheConvention/tabid/2232/Default.aspx).
- PFHxS, its salts and PFXxs-related compounds are under review for possible addition to the Stockholm Convention as well.
- PFHxS and its salts are listed as vPvB, and PFNA and its salts, APFO, and PFOA are listed as PBT by the European Chemicals Agency (ECHA, Candidate List of Substances of Very High Concern for Authorization, https://echa.europa.eu/candidate-list-table).
- For PFPA and PFPIA, evidence of bioaccumulation was primarily for longer chain substances and mixtures.
Precursors

• In addition to reviewing the hazard information presented here, the SAB reviewed a number of degradation/transformation pathways.

• These are the pathways through which a PFAS precursor breaks down into one of the end degradation products.

• The SAB also reviewed the OECD spreadsheet and methodology for identifying PFAA precursors and looked at several representative precursors covering multiple breakdown pathways (See Appendix C for example pathways).

• All the chemicals for which hazard information is presented here are end degradation products in addition to being used intentionally.
Terminal Degradation Products

Transient degradation intermediates

Commercial Products

Raw Materials

PRECURSORS
SAB Recommendation

• Those PFAS that contain:
  – a perfluoroalkyl moiety with three or more carbons
    • (e.g., \(-C_nF_{2n}–\), \(n \geq 3\); or \(CF_3–C_nF_{2n}–\), \(n \geq 2\)) or
  – a perfluoroalkylether moiety with two or more carbons
    • (e.g., \(-C_nF_{2n}OC_mF_{2m}–\) or \(-C_nF_{2n}OC_mF_{m}–\), \(n\) and \(m \geq 1\)), and
  – that are not otherwise listed, be added to the TURA list
• Review Tier II: 5-10 potential filers

• SIC Specific search of business databases and websites to identify potential users: 20-40 estimated filers

• Program staff estimate a total of 25-50 users of PFAS in TURA covered sectors.

• This is a very rough estimate because of the lack of reliable information on use of PFAS.
Opportunities for TUR (p. 14)

- Opportunities for improved process control

- Sector-specific alternatives
  - Textile & fabric treatment
    - For visual/cosmetic applications, elimination may be most practical
    - For protective applications (e.g. firefighters’ protective clothing), need for research on safer alternatives
    - Alternatives can include paraffins, silicones, dendrimers (hyper-branched polyurethane polymers), polyurethane, [siloxanes*], [urethanes*] (*under development & require alternatives assessment)
    - Some companies have focused on specific product lines and specific PFAS. E.g., W.L. Gore has eliminated certain PFAS from over 50% of their “general outdoor product portfolio.”
Opportunities for TUR

- Metal Finishing - Fume suppressants
  - Hexavalent chromium plating and chromic acid anodizing operations
  - Reduce toxic vapors
  - Some products claim to be fluorine-free (may not be appropriate for all baths)
  - Safer alternatives to hexavalent chromium
  - Reducing use and emissions through improved process control, closed-loop processes, and improved O&M
Opportunities for TUR

• Coatings: Food packaging & food contact paper
  – Information on alternatives has been collected by Toxic-Free Future and Clean Production Action; Oregon; Washington
    • uncoated paper; paper with alternative coatings (petroleum or bio-based wax, kaolin clay, silicone and plastic (e.g., PET, PE, PVA, PLA); and non-paper materials, such as aluminum foil

• Low-friction fluoropolymer coatings
  – Medical devices
    • Siloxane-based coatings
  – Cookware
    • E.g. cast iron, enamel-coated cast iron, ceramic & stoneware, stainless steel, carbon steel
Opportunities for TUR

• **Fluoropolymer resins**
  – Used in manufacturing, e.g. insulation & jacketing of wire & cable
    • Variety of high-performance, non-fluorinated alternative resins

• **AFFF**
  – Primarily used by airports, military, & fire depts
    • Also some manufacturing facilities, though not likely to be subject to TURA requirements
  – Internationally, many airports have shifted to fluorine free foams (F3)
  – Many foam manufacturers now offer both options
    • Alternatives are cost competitive
  – MassDEP working with CT DEEP to test several F3 foams
Regulatory Context (p. 17)

- Due to emerging information on health and environmental impacts, and revelations about water supply contamination, a variety of regulatory processes are on-going.

- **International**
  - E.g. Certain PFAS addressed under Stockholm Convention
  - E.g. EU: certain PFAS designated as SVHCs; others on Registry of Intentions for SVHC designation; restriction proposal for PFAS being prepared under REACH
    - Proposal being prepared by 5 member countries (Germany, Netherlands, Norway, Sweden & Denmark), & expected to enter into force in 2025
  - EU Chemical Strategy for Sustainability
Regulatory Context

• Federal
    • 100 lb reporting threshold
    • EPA has identified 172 PFAS meeting the NDAA criteria.
  – TRI: EPA has issued an Advance Notice of Proposed Rulemaking (ANPRM) on possible listing of additional PFAS
    • Considering thresholds “that are lower than the usual statutory thresholds” due to persistence & bioaccumulation concerns
Regulatory Context

- Federal
  - Significant New Use Rules (SNURs)
  - Unregulated Contaminant Monitoring Rule 3 (UCMR 3)
    - Identified drinking water contamination in MA
  - Health Advisory for PFOS and PFOA
  - PFAS Action Plan (2019)
  - Draft Toxicity Assessment for GenX and PFBS (2018)
  - ATSDR toxicological profile (2018)
  - ATSDR exposure assessments
    - Including Barnes Air Force Base in Westfield
  - Dept of Defense – PFAS Task Force; stopped use of AFFF in training, testing & maintenance

Source: ATSDR
Regulatory Context

• State policies & approaches include:
  – monitor & study PFAS;
  – label or disclose PFAS in products
  – limit or ban the use of PFAS;
  – specify that certain product types must be free of PFAS;
  – regulate PFAS levels in groundwater or drinking water.
## Regulatory Context

- **States:** Examples are grouped by **type of activity** in the **text**, and grouped by **state** in **Appendix E**.

<table>
<thead>
<tr>
<th>State</th>
<th>Actions</th>
</tr>
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</table>
| California | - **Biomonitoring:** PFASs are included in the state’s biomonitoring program.¹²³  
            | - **Labelling and disclosure:** In 2017, PFOS and PFOA were listed as known to the state to cause reproductive toxicity under Proposition 65.  
            | - **California Safer Consumer Products Program:** In 2018, the California Department of Toxic Substances Control proposed listing PFAS in carpets and rugs as a priority product under its Safer Consumer Products program,¹²⁴ and in November 2019, it proposed listing PFAS for use on converted textiles or leathers such as carpets, upholstery, clothing and shoes.¹²⁵ |
| Connecticut| - **Drinking water:** The state’s public health department developed a Drinking Water Action Level for drinking water in the state in which the sum of five PFAS chemicals (PFOA, PFOS, PFNA, PFHxS and PFHpA) should not exceed the limit of 70 ppt.¹²⁶ |
| Massachusetts| - **Drinking water:**  
                      o In June 2018, MassDEP’s Office of Research and Standards published recommendations that EPA’s Health Advisories and Reference Doses for PFOS and PFOA also be applied to PFNA, PFHxS, and PFHpA, and that an additive toxicity approach be used. For PFBS, it recommended an interim approach of using the Minnesota standard.¹²⁷  
                      o In December 2019, Massachusetts Department of Environmental Protection (MassDEP) issued a proposed regulation establishing a Total PFAS Contaminant Level (maximum contaminant level – MCL) of 20 ppt for the sum of the concentrations of six PFAS: PFOS, PFOA, PFHxS, PFNA, PFHpA, and perfluorodecanoic acid (PFDA). These regulations were promulgated in October 2020.  
                      - **Groundwater cleanup standards:** Massachusetts DEP proposed and adopted changes to its Waste Site Cleanup regulations to include new standards for PFAS. The groundwater cleanup standard for current or potential drinking water sources is set at 20 ppt for the six PFAS noted above. The standards became effective on December 27, 2019.¹²⁸  
                      - **Context for groundwater and drinking water standards:** MassDEP noted that “since 2013, the sum of the concentrations of the six PFAS compounds above 20 ppt have been detected at over 20 PWSs [public water systems] in Massachusetts.”¹²⁹ |
| Minnesota  | - **Environmentally Preferable Purchasing:** State contract specifications require that compostable food ware products not contain |
Implications for the TURA Program (p. 25)

• Implications of category designation
• Compliance and reporting
• Thresholds
• TURA program services
• Fees and planning-related costs
Implications of Category Designation

• Chemical categories are used in the TURA list in a number of cases.
• TURA’s approach to categories has generally been based on the approach used under EPCRA.
• Most recent example: C1-C4 NOL.
• Defining a chemical category is appropriate in a number of circumstances & can provide several advantages compared with listing chemicals individually.
Implications of Category Designation

ADVERSE SUBSTITUTIONS
INCOMPLETE LIST OF CAS NUMBERS
SIMILAR HAZARDS ACROSS A GROUP
CONFIDENTIAL BUSINESS INFORMATION
Compliance and Reporting

- PFAS often not on SDS
- Facilities can request supplier disclosure
- Facilities can, but need not, conduct their own testing
<table>
<thead>
<tr>
<th>TRI NDAA PFAS individually listed</th>
<th>PFAS NOL Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>• 100 lb threshold</td>
<td>• 10,000/25,000 lb threshold</td>
</tr>
<tr>
<td></td>
<td>• Unless HHS designation</td>
</tr>
</tbody>
</table>
TURA Program Services

• Information
• Continuing Education
• OTA services
• Industry Grants
• Research
Costs and Fees

• The total additional cost in fees to filers (and revenue to the program) could be $27,500 to $55,000 in per-chemical fees (25-50 filers for PFAS NOL).

• No new base fees are estimated at this time.
Thank you