TUR Options Identification and Evaluation

Pam Eliason, Toxics Use Reduction Institute
pam@turi.org

Linda Swift, Capaccio Environmental Engineering
lswift@capaccio.com

Capaccio Environmental Engineering, Inc.

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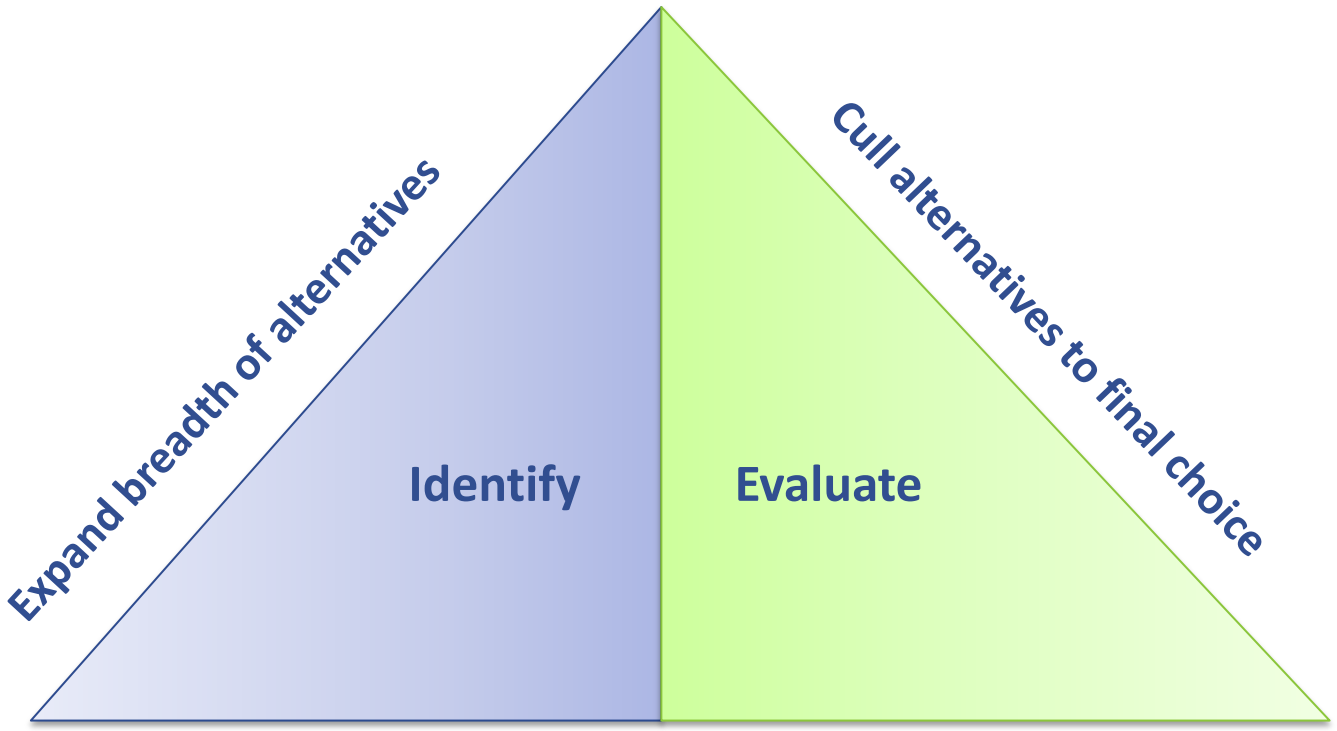
TUR Option ID and Evaluation Process

For *each* toxic in *each* production unit:



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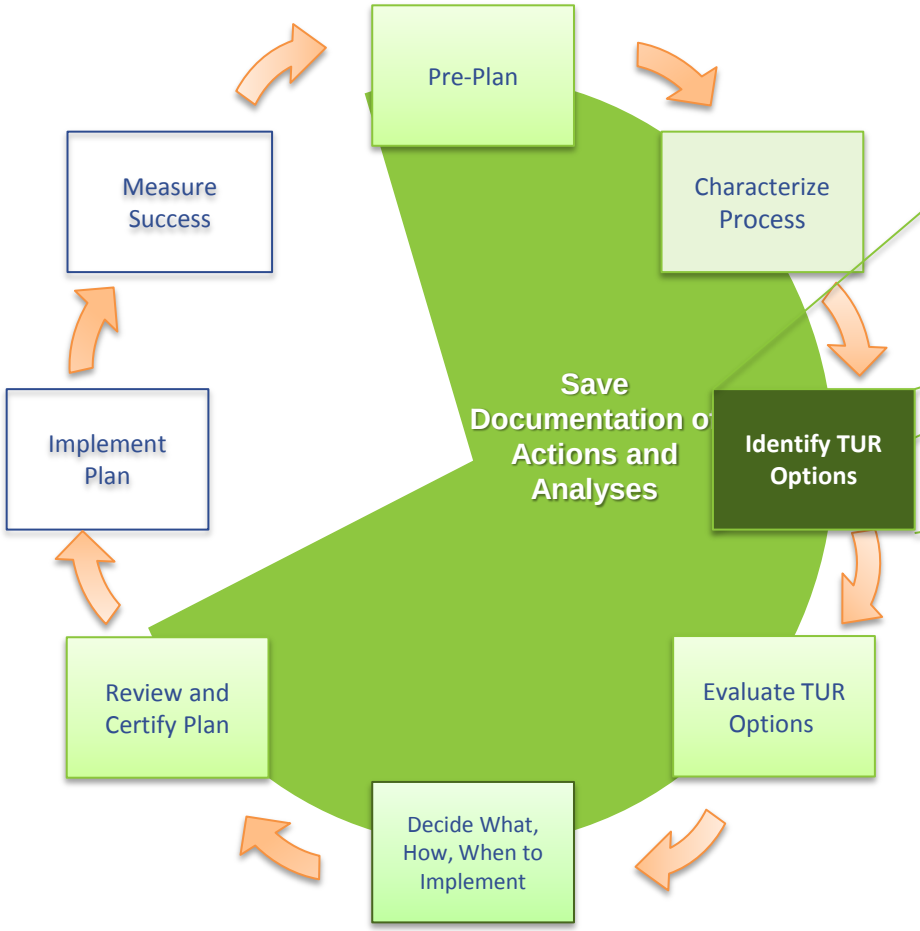
Options Identification



- Identify as many TUR options as possible
- Use The 6 TUR techniques as a framework for process

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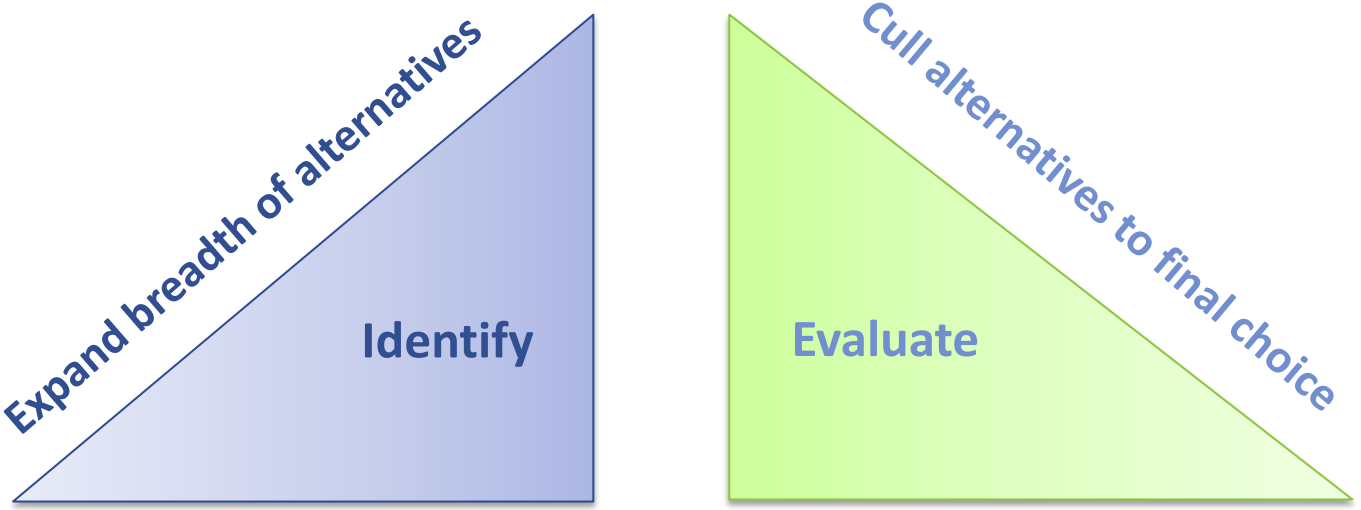
Introduction to Identifying TUR Options



- Creative phase
- Generate complete list of TUR opportunities
  - Obvious opportunities
  - Hidden opportunities
- Costs / benefits

TURA Requirements for TUR Option Identification (310 CMR 50.45)

The Toxics Use Reduction Act requires companies to include in their plan a **written description of the procedure** they used to identify technologies, procedures or training programs for ***potentially achieving*** TUR for each production unit. The written description of the TUR options ID procedure must include:

- Consideration of the six TUR techniques
- Personnel involved in the TUR options ID process
- Description of information sources consulted
- Description of techniques used for gathering information
- List of technologies, procedures or training programs identified

The Six TUR Techniques

- Input Substitution
- Product Reformulation
- Production Unit Redesign/Modification
- Production Unit Modernization
- Improved Operations and Maintenance
- Recycling which is integral to the process

TUR Planning Team

- Who should be on the team
- When do you engage the various members of the team

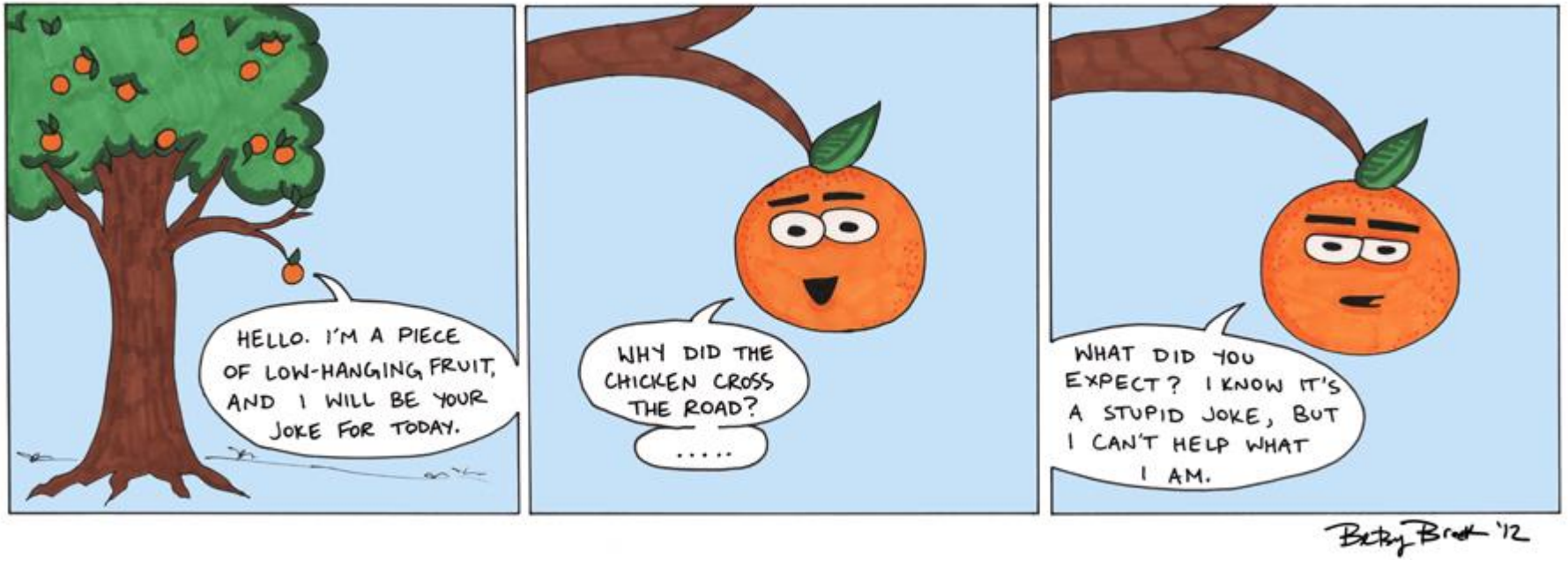
- Create meeting agendas, including objectives of the meeting and anticipated next steps, to help ID who should be in the room

Identifying TUR Options

- Brainstorm with team
- Literature review
- Vendors
- Industry associations
- Regulatory agencies (OTA)
- Customers
- Other

Document !

Going Further than the Low Hanging



- Be systematic
- Revisit past ideas
- Enlist the right team

Be Systematic in your Evaluation

Create a unique option identification #

Identify production unit, toxic chemical and TUR technique

Assure the option:

- Meets definition of TUR
- Is technically feasible

Determine if implementation of the option would:

- Create process concerns
- Raise employee H&S concerns
- Create potential environmental impacts
- Cause additional regulatory burden

Document !

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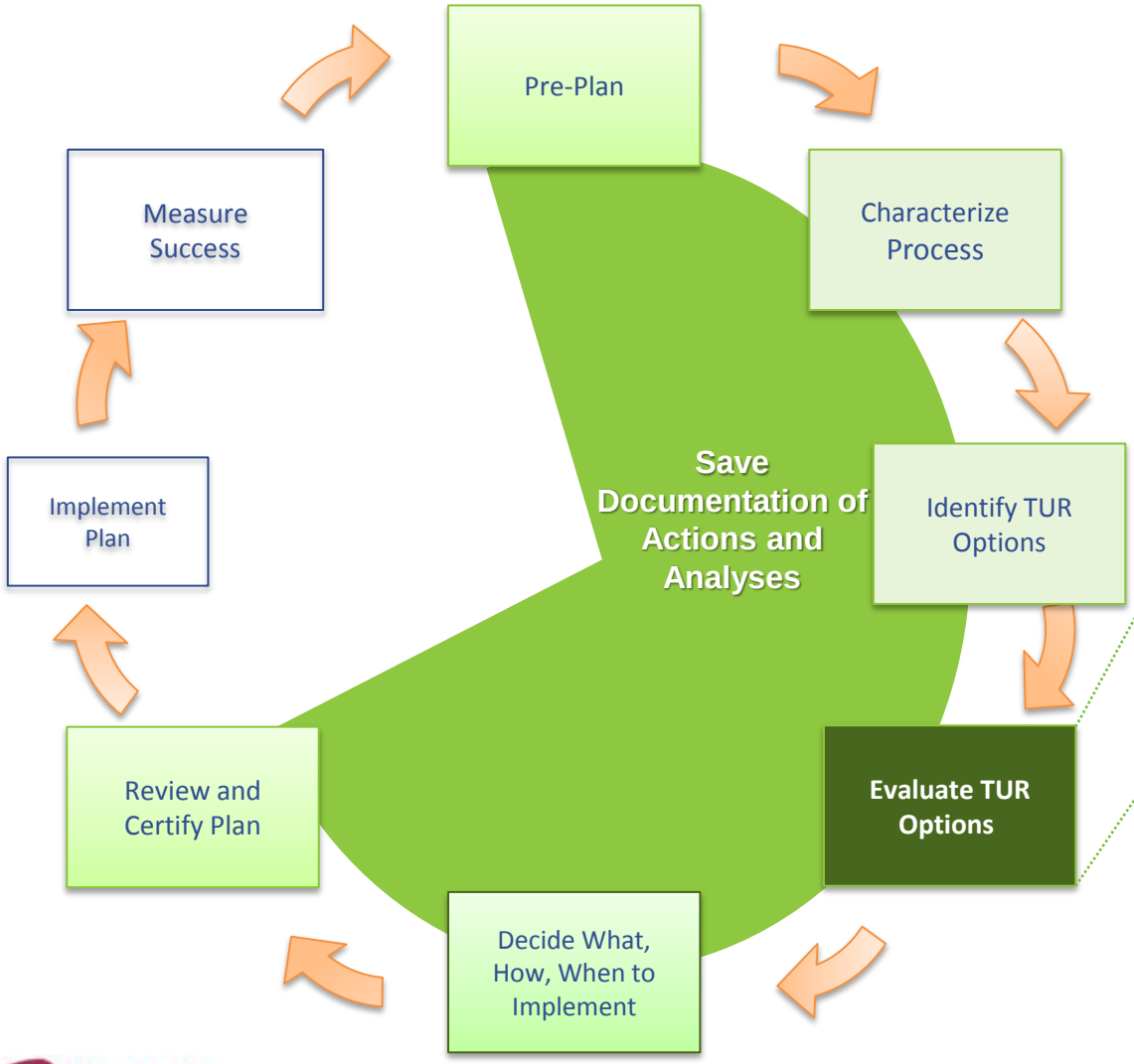
- **Question #1**: Identify potential TUR options for each of the TUR techniques

Evaluate TUR Options



- **Evaluate TUR Options**
  - Technical
  - EH&S (Input Substitution)
  - Economic

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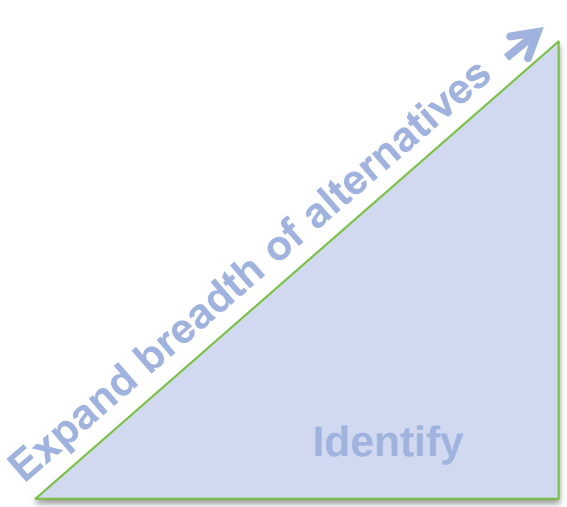
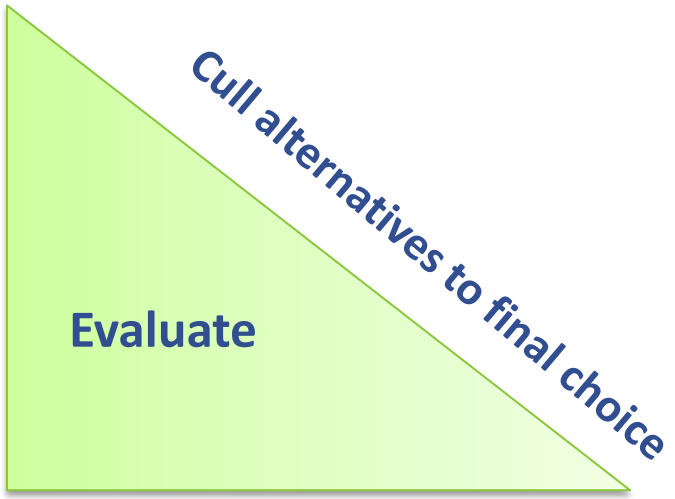




Eliminate Options

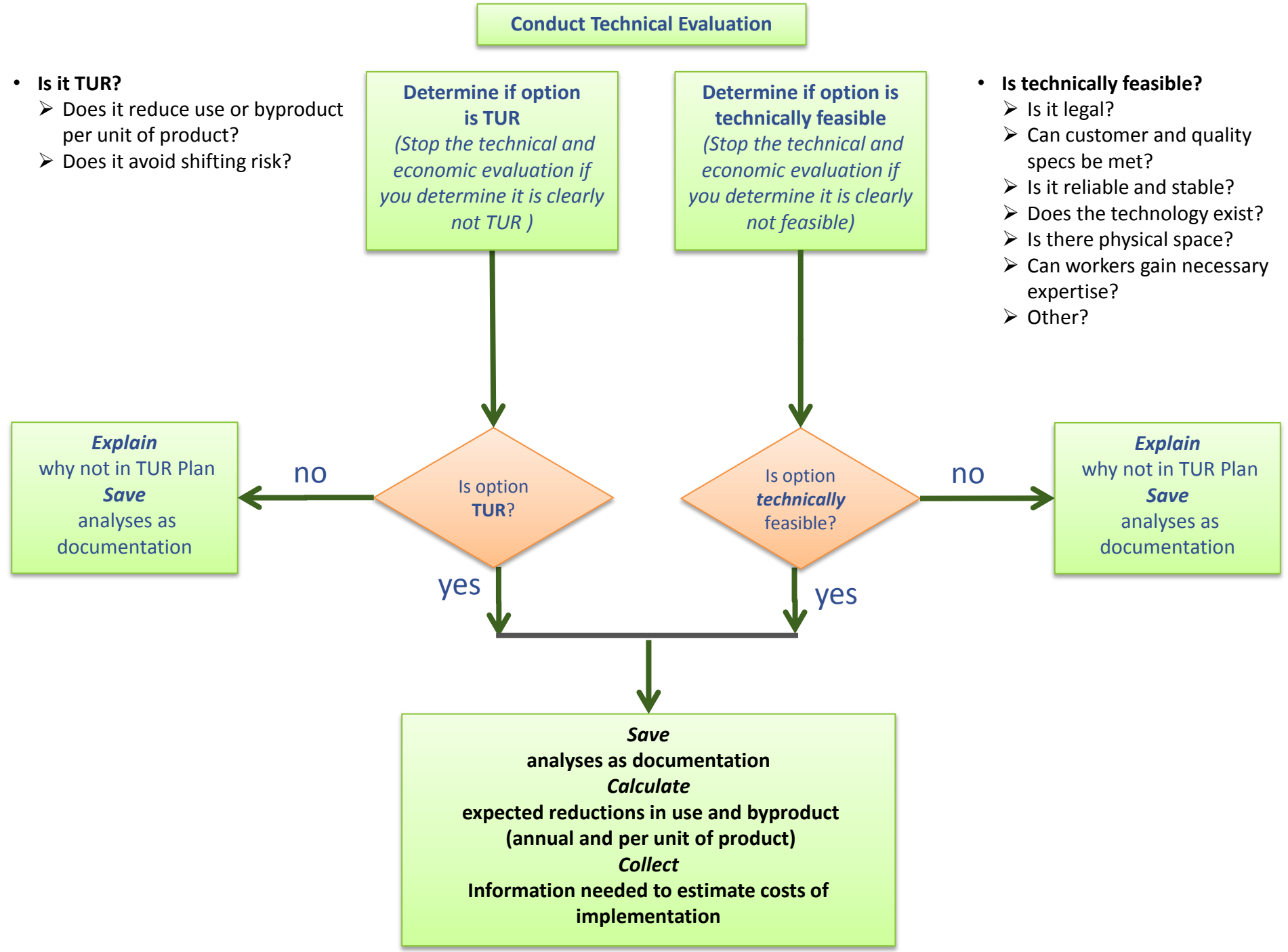
- Technically infeasible
- Not TUR

Evaluate Remaining Options

- Technical evaluation
- EH&S evaluation
- Economic evaluation

50.46: Technical Evaluation of Toxics Use Reduction Techniques

1) Toxics users shall evaluate the technical feasibility of each technology, procedure, or training program (TUR option) listed in the plan:
   a) Whether the TUR option constitutes toxics use reduction
   b) Calculate the expected reductions resulting from implementation of the TUR option
      1. Expected reductions in the amount of toxics used in each production unit;
      2. Expected reductions in the amount of toxics used per unit of product for each production unit;
      3. Expected reductions in the amount of toxics generated by each production unit;
      4. Expected reductions in the amount of toxics generated as byproduct per unit of product for each production unit.
   c) Evaluate the relationship between the TUR option being evaluated, and other applicable laws and regulations, including but not limited to, whether implementation of the option will violate any other law or regulation.


Conduct Technical Evaluation
Is it TUR?
Does it reduce use or byproduct per unit of product?
Does it avoid shifting risk?
Determine if option is TUR
(Stop the technical and economic evaluation if you determine it is clearly not TUR)
Determine if option is technically feasible
(Stop the technical and economic evaluation if you determine it is clearly not feasible)
Is technically feasible?
Is it legal?
Can customer and quality specs be met?
Is it reliable and stable?
Does the technology exist?
Is there physical space?
Can workers gain necessary expertise?
Other?
Explain why not in TUR Plan
Save analyses as documentation
no
Is option TUR?
Is option technically feasible?
no
Explain why not in TUR Plan
Save analyses as documentation
yes
yes
Save
analyses as documentation
Calculate
expected reductions in use and byproduct (annual and per unit of product)
Collect
Information needed to estimate costs of implementation

Technical Evaluation … in English

- Is it TUR?
- Calculate Expected Reductions
  - Toxics used in production units and by unit of product
  - Toxics generated in production units and by unit of product
- Evaluate the impact on other regulations/laws if the TUR option is implemented

Technical Infeasibility "Off-Ramp"

50.46: Technical Evaluation of Toxics Use Reduction Techniques

2) Toxics users need not complete the evaluation of a particular TUR option if, during the evaluation, the toxics user determines that the TUR option being evaluated is not appropriate for any of the following reasons:
   a) the technique is clearly technically infeasible;

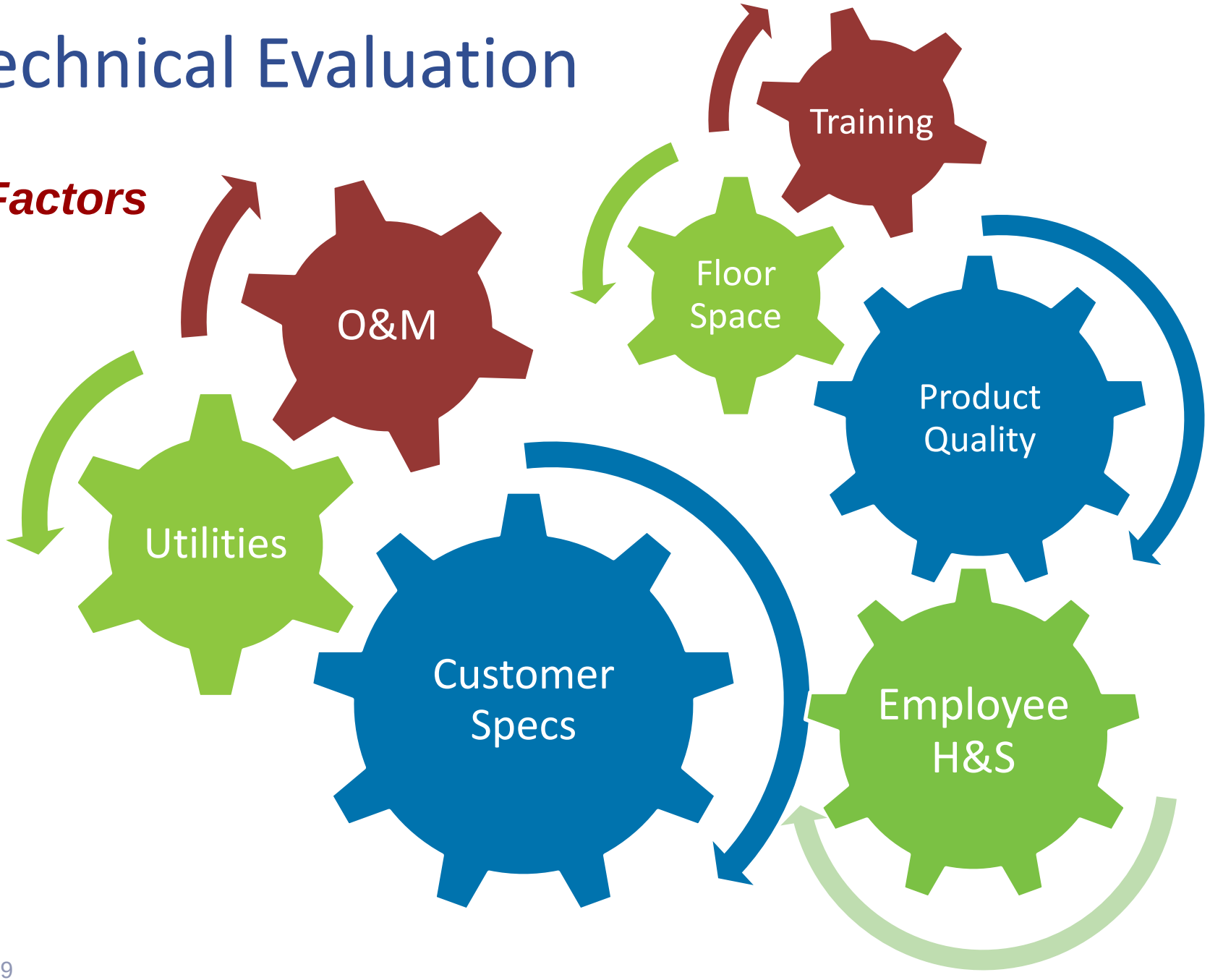
- Technical infeasibility determination should be in accordance with your business' existing methods for evaluating projects
- Use your technical expertise to evaluate
- Document your process!

What is “Technically Infeasible?”

Equipment	• Not available • Cannot be developed
Workers	• Inadequate skills readily available
Product quality	• Change would render quality unacceptable
Regulatory	• Impacts ability to meet other regs • Unacceptable increase in regulatory burden

Technical Evaluation

Factors



Qualitative Issues

Productivity

Product Quality

Market Share

Stakeholder Relations

Public Image

Liabilities

- Storage and Disposal
- Real Property Damage
- Civil Actions/ Toxic Tort Suits
- Fines and Penalties
- Regulatory Impact

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50.46: Technical Evaluation of Toxics Use Reduction Techniques

(4) For TUR options that the toxics user decides to implement, the plan shall include:

a) a description of the TUR option to be implemented;
b) the anticipated costs and savings associated with TUR option
c) the expected reductions in the amount of toxics and the amount of toxics generated as byproduct resulting from implementation of the TUR option
d) an implementation schedule.

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Implementation Schedules

- Document progress of implementation for each option
- Build into your existing processes

For example:

Option ID	Description	Responsible Party	Tracking Tool	Schedule	Progress

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- **Question #2**
  - Performance criteria for TUR options identified
  - Where would you find information
  - What is sufficient justification to list an option as “technically infeasible”?

EH&S Assessment Considerations

Is this a preferable solution/material?

- Comparison with existing material
- Comparison with corporate/organizational criteria
- Benchmarks

Health and environmental effects

Significant life cycle effects (qualitative)

Significant potential exposure

Uncertainty

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What can we do to Eliminate Regrettable Substitutes Faster?

- PBTs
- Carcinogens
- CMRs
- Restricted Substances Lists
- Consider criteria for screening contaminants, mixtures, etc.

TURI Alternatives Assessment

- Screening criteria include: PBT, carcinogenicity, SAB listing of more hazardous chemicals
- Collected environmental, health and safety data for alternatives
- Conducted research into technical and economic feasibility
- Information available at:
  - www.turi.org/alternatives_assessment

Principles for Alternatives Assessment

- Reduce Hazard
- Minimize Exposure
- Use Best Available Information
- Require Disclosure and Transparency
- Resolve Trade-Offs
- Take Action

TURI EH&S Data Sources Guide

Pollution Prevention Options Assessment System (P2OASys)

Green Screen

EPA Design for Environment

Tools to Avoid Regrettable Substitutes

TURI's Library Guide for EH&S Data Resources

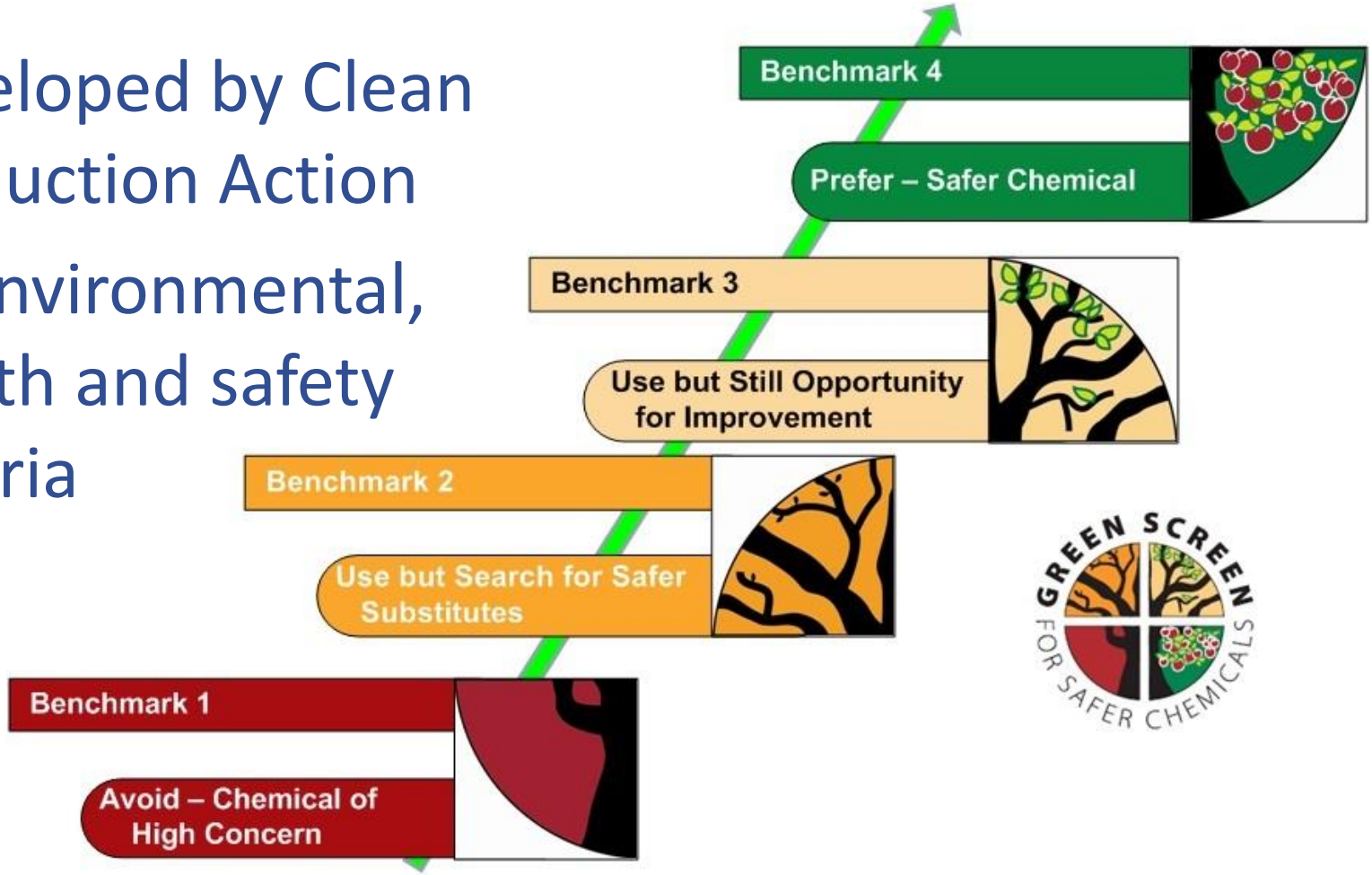
- Authoritative sources for chemical hazard data
- Regulatory drivers
- Tools, databases and models
- Go to: http://guides.turi.org/index.php
  - EH&S data resources option on left hand box

P2OASys EHS Evaluation

- Pollution Prevention Options Analysis System
  - www.turi.org/p2oasys
- Developed to support TUR Planners systematically examine potential environmental and worker impacts of TUR options
- Compares TUR options with company's current technology based on quantitative and qualitative factors
- Weighted scores to 10 – higher scores are less safe options

Green Screen

- Developed by Clean Production Action
- 17 environmental, health and safety criteria



http://www.cleanproduction.org/library/Green_Screen_Report.pdf

Green Screen Benchmarking DecaBDE

Chemical	CAS#	% in Formulation	Human Health Effects													Ecotox.		Fate		Breakdown Products	
			Priority Effects																		
			Carcinogenic	Mutagenic	Reproductive	Developmental	Endocrine Disruption	Neurological	Acute Toxicity	Systemic/Organ Effects	Sensitization (skin)	Sensitization(respiratory)	Irritation/Corrosion (skin)	Irritation/Corrosion (eyes)	Immune System Effects	Acute	Chronic	Persistence	Bioaccumulation	Metabolites	Degradation Products
Decabromodiphenyl ether (decaBDE) - CAS# 1163-19-5																					
DecaBDE	1163-19-5	97	**M**	**L**	**L**	**M**	**M**	**M**	**L**	**L**	**L**	nd	**L**	**L**	nd	**L**	**L**	**vH**	**M**	penta- to nona-BDE	tri- to nona-BDE
Breakdown Products																					
PentaBDE	32534-81-9		nd	**L**	**M**	**M**	**H**	**M**	**L**	**H**	**L**	**L**	**M**	**M**	nd	**H**	**H**	**vH**	**vH**		
OctaBDE	32536-52-0		nd	**L**	**M**	**H**	**M**	**M**	**L**	**H**	**L**	nd	**L**	**L**	nd	**L**	**L**	**vH**	**M**	nd	lower PBDEs

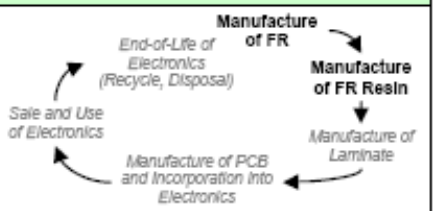
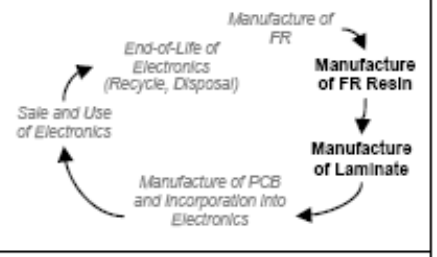
Bold text = based on experimental data. ***Black italics text*** = based on analog data or expert judgment.

Design for the Environment

- Developed by U.S. EPA
- The DfE Safer Product Labeling Program
- DfE Screens for Safer Chemical Ingredients
- DfE's Alternatives Assessments program

http://www.epa.gov/dfe/

DfE Alternatives Assessment Results

Chemical	CASRN	Human Health Effects									Aquatic Toxicity		Environ-mental		Exposure Considerations
		Acute Toxicity	Skin Sensitizer	Cancer Hazard	Immunotoxicity	Reproductive	Developmental	Neurological	Systemic	Genotoxicity	Acute	Chronic	Persistence	Bioaccumulation	Availability of FRs throughout the lifecycle for reactive and additive FR chemicals and resins[2]
Reactive Flame Retardant Chemicals[2]															
Tetrabromobisphenol A (TBBPA) (Albemarle, Chemtura, and others)[3]															
TBBPA	79-94-7	L	L	L	L	L	M	L	L	L	H	H	M	L	
DOPO (6H-Dibenz[c,e][1,2] oxaphosphorin, 6-oxide) (Sanko Co., Ltd. and others)															
DOPO	35948-25-5	L	L	L	L	L	L	L	L	L	M	M	L	L	
Fyrol PMP (Aryl alkylphosphonate) (Supresta)															
Fyrol PMP	Proprietary	L	L	L	L	L	L	L	L	L	L	L	H	L	
Reactive Flame Retardant Resins[2]															
Reaction product of TBBPA - D.E.R. 538 (Phenol, 4,4'-(1-methylethylidene)bis[2,6-dibromo-, polymer with (chloromethyl)oxirane and 4,4'-(1-methylethylidene)bis[phenol]) (Dow Chemical)															
D.E.R. 538	26265-08-7	L	M	M[0]	L	M[0]	M[0]	L	L	M	L	L	M	L	
Reaction Product of DOPO – Dow XZ-92547 (reaction product of an epoxy phenyl novolak with DOPO) (Dow Chemical)															
Dow XZ-92547	Proprietary	L	M	M[0]	L	M[0]	M[0]	L	L	M[0]	L	L	H	L	
Reaction product of Fyrol PMP with bisphenol A, polymer with epichlorohydrin (Representative Resin)															
Representative Fyrol PCB Resin	Unknown	L	L	M[0]	L	M[0]	M[0]	L	L	M[0]	L	L	H	L	

[1] The moderate designation captures a broad range of concerns for hazard, further described in Table 4-3.
[2] Reactive FR chemicals and resins may not completely react, and small amounts may be available during other parts of the lifecycle.
[3] The EU has published a comprehensive risk assessment for TBBPA in reactive applications. This risk assessment is a valuable source of information for choosing flame retardants for printed circuit board applications.

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TUR Planners are the Experts!

- Manufacturers, retailers and government agencies are requiring alternatives assessments
- Alternatives assessment is [illegible] identifying safer, effective and affordable a[illegible]
- YOU are the expert in this [illegible]ed TUR Planner has very marketa[illegible]

Thank you

QUESTIONS?