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Alternative Response Technology Overview

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ART – Outline

- Description of the ART program and organization
 - Timeline of key events during the response
- ART “triage process” of evaluating technology submittals
- List of successful technologies field tested
 - Example technology successes deployed
- Future plans & summary

Statistics on Ideas

Total	123,000	individual ideas
Subsurface well issues	80,000	
Spill control	43,000	
Within spill control, ideas worth considering	470	
Remediation	170	
Booming, skimming, sand cleaning, mechanical, sorbents, etc.	300	
Formally evaluated or tested in field	100	
Significant use	> 30	

NOTE: For existing & established capabilities, PSE (Product, Services & Equipment), a separate database containing ~57,000 entries was created

ART Program Sponsor and Objectives

- Sponsor: the United Area Command (UAC) in New Orleans
- Objectives: Evaluate use of new, improved and emerging technologies to address operational needs
 - Establish a system to gather and categorize new ideas
 - Evaluate and rank technologies within specific categories
 - Prioritize technologies to address operational needs
 - Conduct tests and provide feed-back to Command
 - Coordinate with Federal Interagency Alternative Technology Assessment Program (IATAP)

ART Success Measures Area Commander, July 2010

- **Material** – will it make a real difference in terms of capability or result?
- **Scalable** – can it be used across the response effort?
- **Timely** – can it be used now?
- **Viable** – is it realistic to believe it will work soon?

ART Timeline

April 20	<i>Deepwater Horizon</i> MC252 Incident begins
April 27	Houston call center established
April 30	Database established
May 2	ARTES representative arrives at ICP Houma
Early May	Houma/Houston teleconferences (3X/week) begin
May 20	High Interest Technology Testing (HITT) Strike Team established (arrives in Mobile 1 June)
May 25	Initial sorbent boom field testing
June 4	IATAP announcement
June 23	Biological and Chemical Technology Strike Team established
Mid-July	Well flow is stopped
July 27	Final round of technologies identified for evaluation
Sept 30	Comprehensive ART report issued
Oct 4	ART Transition to Gulf Coast Restoration Organization, with ongoing accountability to support response

ART Organization

- ART Houston: Management, Support and Coordination
- ARTES & High Interest Technology Team (HITT): Evaluations, Field Testing and Recommendations
- Strike Teams as needed: Evaluations, Field Testing and Recommendations
- Liaison/Coordination positions: Houma ICP and Mobile ICPs, Unified Area Command and Federal Interagency Alternatives Technology Assessment Program (IATAP)
- Experts from various organizations
 - BP
 - USCG
 - NOAA
 - OSPR
 - EPA
 - Other organizations, consultants and professional responders

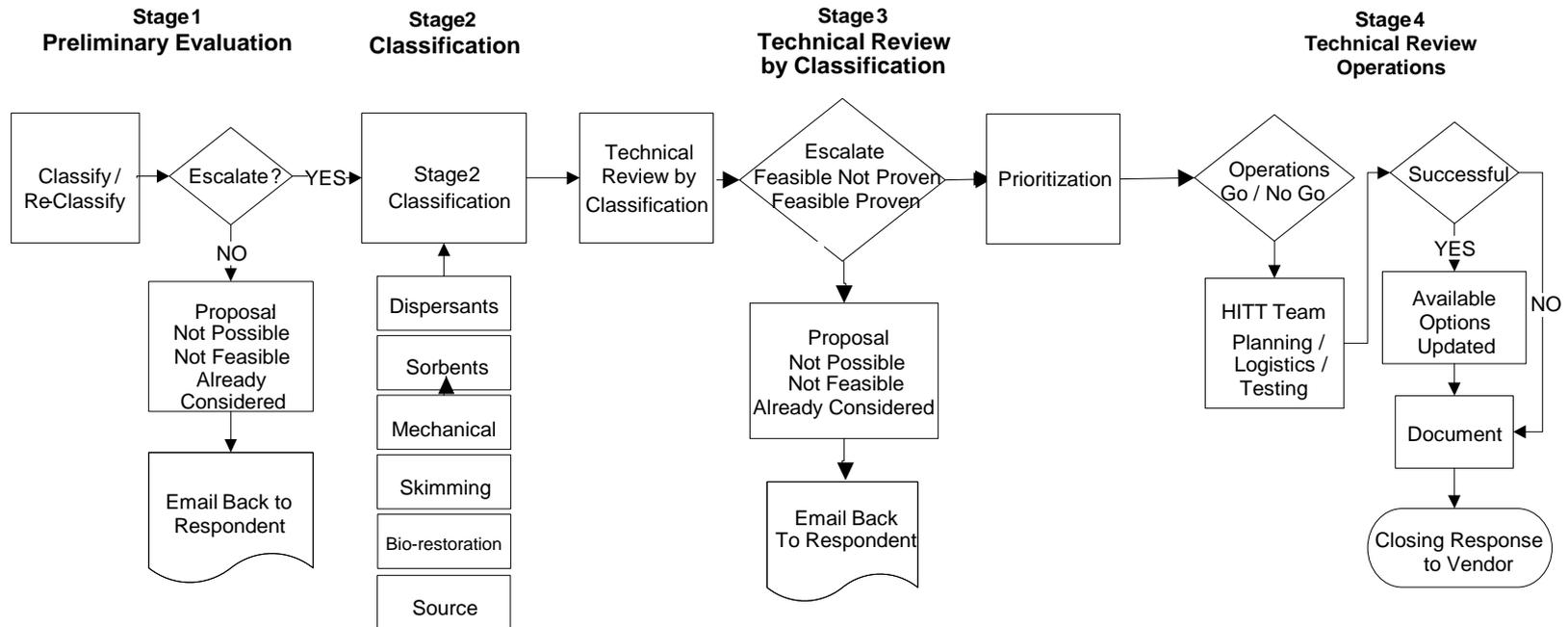
Sources of Ideas

- ART database (direct submission on internet or thru BP call center)
- Operations & field-derived
- “Open House” meetings held at parishes
- Louisiana Business Emergency Operations Center
- Public Information Emergency Response (PIER) system used before deployment of the ART database

All ideas entered into the ART database for tracking and scoring

Four Stage Comprehensive Triage Process

Alternative Response Technology Triage Process



ART – Booming, Skimming, Separation



ART – Sand Cleaning



List of Recommended Items (Successes)

• Offshore

- Laser Fluorometer Submerged Oil Detection (Oscar)
- Coda Octopus for Submerged Oil Detection
- Big Gulp Skimmer

• Near Shore

- Tarball Net and Test Net
- V2 Vyper Platform for Marsh and Shallow Water Skimming
- Parachute Surf Skimmer
- Helicopter Boom Removal
- Yates Boom Cleaner
- Boom Blaster (Boom Cleaning Machine)
- Opflex Buoyant Open-cell Foam
- Low Pressure Marsh Flusher
- Amphibious Tool Carrier (Truxor DM 5000)
- Water Curtain (DO2E Wastewater Treatment)
- Oil/Water Separation: Ocean Therapy Solutions
- Bio Based Absorbent (Nature's Broom) – oil cleaning on beach/marshes
- Bio Based Absorbent (Nature's Broom) – decon/cleaning procedures
- Heavy Oil Skimming System (HOSS)
- Silt Barrier Fence (X-Tex®)
- Eco-Barrier Trinity Fence
- RAT (Rapid Attack Tactic) for Skimming

• Onshore

- Bio Energy Gasifier
- Green Earth Sand Cleaner
- Petromax Sand Wash
- M-I SWACO Sand Cleaning
- STS-101 Solids Washing
- Eco-Oil Vortex (Beach Sand Washer)
- Gravely Sand Cleaner
- Ergonomic Beach Cleaning Tool (EZ-Zacks)
- Sand Shark 3000 LeeBoy for Beach Cleaning
- Ozzies OPP-200 for Beach Cleaning
- Beach Tech 2000 & 3000 for Beach Cleaning
- Cherrington 4600 & 5000 for Beach Cleaning
- RECOVERIT from GOLF Energy Service
- Clean Beach Technologies, Inc (Beach Restoration System™)
- Chemstation Degreaser
- Biomass Based Sorbent (Show Me Energy)
- Field Analytical Methods (SiteLab Corporation)
- REUSE recycling

Evaluated Technologies Used During Response – 1 of 2

- **Big Gulp Skimmer in use since June, over a million gallons of oil/water recovery**
- Low Pressure Marsh Flusher – cleaned 15 miles of Barataria Bay oiled marsh since July 18
- Water Curtain at Pensacola Beach beginning July 22 without impacting vessel travel
- Ocean Therapy oil/water separators – 32 ordered and put into service
- **Heavy Oil Skimming System (HOSS) – invented in June by a captain and adopted widely (100 manufactured) during offshore response operations**
- Silt Fence Barrier (2 submitters) – 30 miles installed protecting shorelines in MS and AL
- Rigid Boom (2 submitters) – over 3 miles installed in Pass Abel, Barataria Bay
- **Boom Blaster boom cleaning system (using “car wash” concept) operated at Grand Isle**
- Yates boom cleaning system (using “dishwasher”) with assembly line like transport system in use in Biloxi – processing over 15,000 feet of boom a day
- Use of barge barriers with vacuum trucks to divert and recover oil (Pass Abel and Four Bayous Passes, Barataria Bay) – a new combination of existing equipment, coupled with Rigid Pipe Boom

Evaluated Technologies Used During Response – 2 of 2

- **Sand Shark’ beach cleaning device developed and five deployed**
- Industrial Mobile Sand Cleaners used at various Gulf Coast locations: Ozzies, two Beach Tech models (six machines used at Horn Island) and two Cherrington models (Grand Isle)
- 3 Gravely sand cleaners in use – Grand Isle State Park, Fourchon LA, Alabama
- Sand Cleaning MI Swaco System being used at Grand Isle with capacity of 1 million pounds of sand per day
- Current Buster Skimming System for collecting and retaining oil at towing speeds up to 4 knots
- Boom Vane – a fast water-oil boom deployment system
- Degreaser by Chemstation for cleaning vessels and equipment with encrusted heavy oil
- Ergonomic Beach Cleaning Tool for scooping tar balls from beaches
- **Wave Glider (Advanced Unmanned Water Quality Monitoring Vehicles) by Liquid Robotics deployed in Gulf of Mexico**
- Opflex buoyant open-cell foam – 2 million square feet utilized (mix of boom, pads, pom-poms, etc.) in LA in the marshes, with the VOO fleet at sea and out of Mobile CP

Big Gulp Skimmer

- Concept Description
 - Recovering the oil from the surface, offshore, close to the source
 - Fixed weir skimmer, mounted on barge, towed by two boats
 - Mechanical aspects, monitoring, water and oil phase handling well defined
 - Remain competitive with more complex and expensive skimmers
- Status in Proving/Testing Process
 - Used on MC252 spill
 - HITT evaluation on July 19, 2010
 - Put into service early in the event, as a critical resource
 - Deployed in Louisiana, offshore
 - Over a million gallons of oil and water recovered (mostly oil)
- Concept Origin
 - LAD Services, Lance DeHart



Heavy Oil Skimming System (HOSS)

- Concept Description
 - Collect Heavy Oil or Tarball near shore –reduce onshore impact
 - Aluminum frame equipped with netting, pulled by shrimp boats
 - Earlier called as Heavy Oil Recovery Device (HORD) (or Tarball Recovery Device - TRD)
- Status in Proving/Testing Process
 - Concept tested and deployed; all ICs are pursuing
 - One boat collected two tons during testing
 - Manufactured in quantity
- Concept Origin
 - Gerry Matherne, a responder from Florida



Boom Blaster (Boom Cleaning Machine)

- Concept Description

- Car washing machine idea adopted for boom cleaning
- Steps involved: rinsing, adding citrus cleaner or other detergent, scrubbing, pressure washing, and then rinsing again
- Six oscillating nozzles power wash the boom with a max pressure of 2,700 psi and water temperature of 180 degree F
- Machine can operate continuously, 24-hrs a day and requires 5 personnel to operate
- Designed capacity under ideal condition 600 feet of boom/hr

- Status in Proving/Testing Process

- Evaluated on July 14, 2010 and August 19, 2010 at Grand Isle Staging Area
- Fewer safety issues with this then with traditional manual boom cleaning
- Worked as designed and substantially increased the efficiency of cleaning boom
- Actual processing rate lower than claimed
- Several ideas proposed to further improve the efficiency of cleaning boom
- Recommended. Used at Grand Isle, LA

- Concept Origin

- Gulf Coast Environmental Resources, LLC, ART Database



Sand Shark 3000 LeeBoy for Beach Cleaning

- Concept Description

- Beach Cleaning by mechanical means without using any chemicals
- LeeBoy 3000 originally designed as a material loader for the paving and road maintenance.
- A hybrid unit developed by BP to improve beach cleaning capabilities. Over 30 modifications and improvements made for beach cleaning applications. Uses 2 mm sieve for removal of contaminated material.

- Status in Proving/Testing Process

- Comparable tests were performed at the Eglin Air Force Base in Fort Walton Beach, FL, on six different devices on August 3, 2010. Tests led by Leonard Linn of Mobile ICP and witnessed by HITT team.
- Tested Sand Shark 3000, Ozzies OPP-200, Beach Tech 2000 & 3000, Cherrington 4600 & 5000.
- Sand Shark performance was the best. Reduced contaminated material from 100 ppm to less than 10 ppm, tested for 12" sand depth and still maintained a reasonable speed.
- Can be further improved and optimized

- Concept Origin

- Operational Need identified thru Mobile ICP
- Leonard Linn (BP)



Contaminated Beach Example



Material (oil) recovered



Sand Shark Cleaned

Wave Glider for Monitoring of Water Quality

- Concept Description

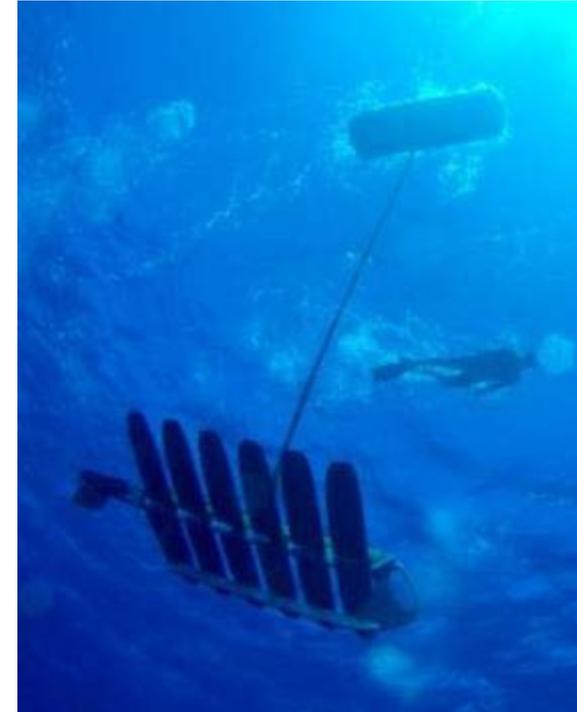
- Technology for constant monitoring of water quality by satellite-controlled, unmanned vehicles (Wave Glider)
- Wave Glider energy self-sufficient and autonomous: Vehicles get propulsion power from wave action and use solar power for their electronics
- Provide a steady stream of data about water quality (detection of any emulsified, dissolved and dispersed oil in water, phytoplankton, dissolved oxygen); marine mammal vocalizations; weather and water temperature

- Status in Proving/Testing Process

- Proven. Technology developed since first prototype built in 2005 by Liquid Robotics in Silicon Valley, California
- Used by government/military, scientific/environmental and industries
- First wave glider being deployed by BP to the vicinity of the Macondo well, second planned to be deployed during September
- Initially a set of nine optical sensors will be calibrated for monitoring water quality including trace amounts of dispersed oil, and will then add acoustic monitoring of marine mammal activity.
- Further development and testing in progress

- Concept Origin

- Roger Hine, President of Liquid Robotics



Coda Octopus Sonar for Submerged Oil Detection

- Concept Description

- Uses sonar to detect solid tar mats or dense locations of tar balls on the sea floor
- U.S. Coast Guard used this for detection of divers/underwater intruders and other underwater searches
- Runs at 375 and 610 khz – frequencies not harmful to sea life

- Status in Proving/Testing Process

- Initially Coda tested by Coast Guard in a facility (OHMSETT, NJ) during 2009 and was observed to detect oil in clear water conditions
- Recently Coda successfully tested with EIC Oscar prototype in water depths from 3 to 33 ft. Testing done during early October 2010 in Coast Guard Fire Safety Test Facility; Mobile Bay Area, AL; Dauphin Island and Katrina Cut; Fort Morgan and Mobile Point
- A 24-foot research vessel used for the test along with a fish finder to detect possible test site
- Recommended that Coda Octopus sonar system be used for the response

- Concept Origin

- US Coast Guard R&D Center, Coda Octopus Products Inc

Coda Sonar Head



Coda & Oscar on vessel



Future Plans

- Continuing BioChem Strike Team Projects
 - LSU lab tests, field tests
 - Possible testing of other agents thereafter
- Remainder of the feasible ideas to be addressed by:
 - Gulf Coast Restoration Organization (GCRO) as part of its ongoing spill response R&D program, or by
 - BP's Drilling and Completions Technology Group for source related submissions

ART Program – Lessons Learned (Organization)

- ART Team should report to Unified Area Command & should be a requirement of the Incident Command System
- ART Team should have well defined roles and accountabilities for planning & project management; with experienced responders & agency reps (USCG, NOAA, OSPR) and a role to address VIPs
- A single High Interest Technology Test (HITT) team leader should establish HITT Teams in ICPs as necessary for testing purposes
- Establish alignment with ICP Operations Section for take-up of new proven/recommended technologies
- Establish a tracking tool for take-up of new technologies
- Establish and implement an external, pro-active communication strategy and promote successes

ART Program – Lessons Learned (Process)

- A single database should be used for the public to submit ideas
- Submission format & minimum required info level should be established
- Database should have an effective “search” engine
- A 4-stage review and testing process should be established
- Develop a scoring system that considers ability to test and “fit” with current spill recovery operational needs
- Include a communication mechanism for informing submitters
- For products, services and equipment submittal information, include evidence from vendor where their technology is proven

Summary

New approach for Alternative Response Technology:

Inclusive process for capturing ideas real time mostly via internet

- Leveraged public's ingenuity and entrepreneurial spirit in idea submission.

Collaboration of technical experts from diverse organizations

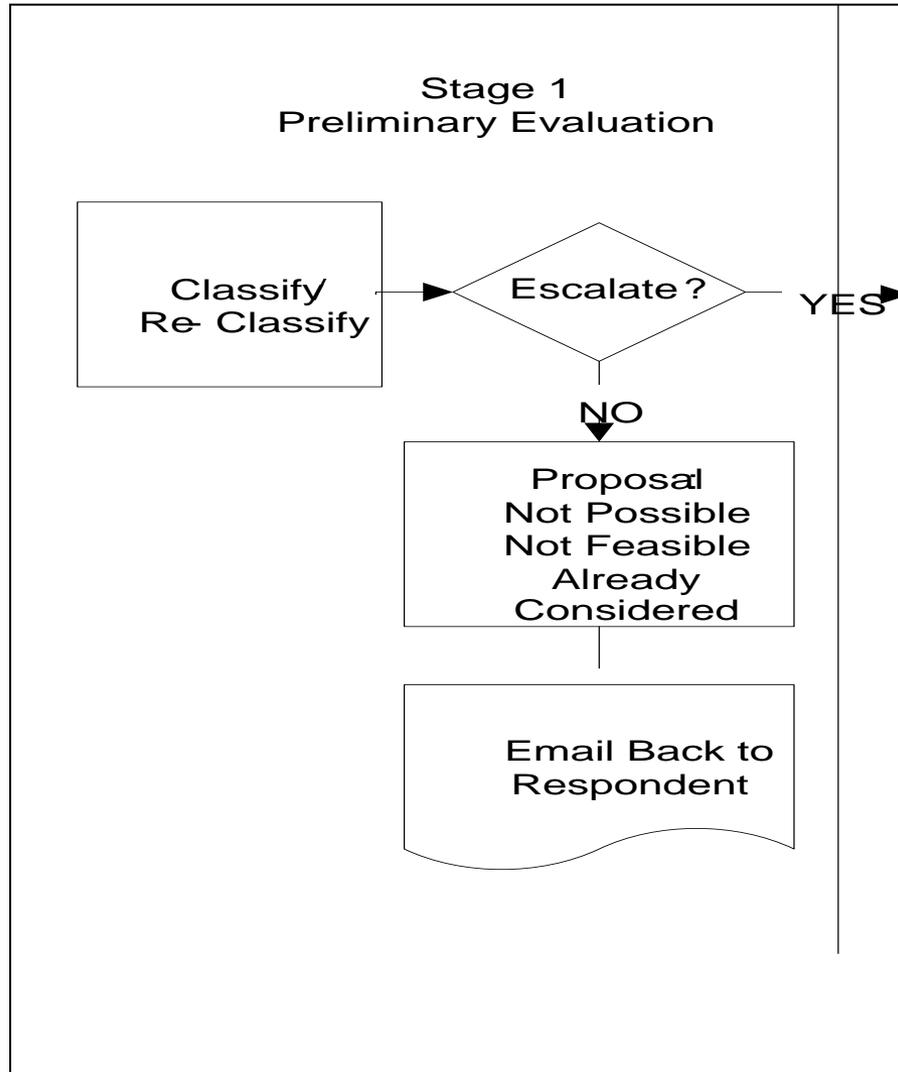
- BP, USCG, NOAA, OSPR, EPA, other organizations, consultants, responders

Comprehensive process used for selecting ideas for evaluations/testing

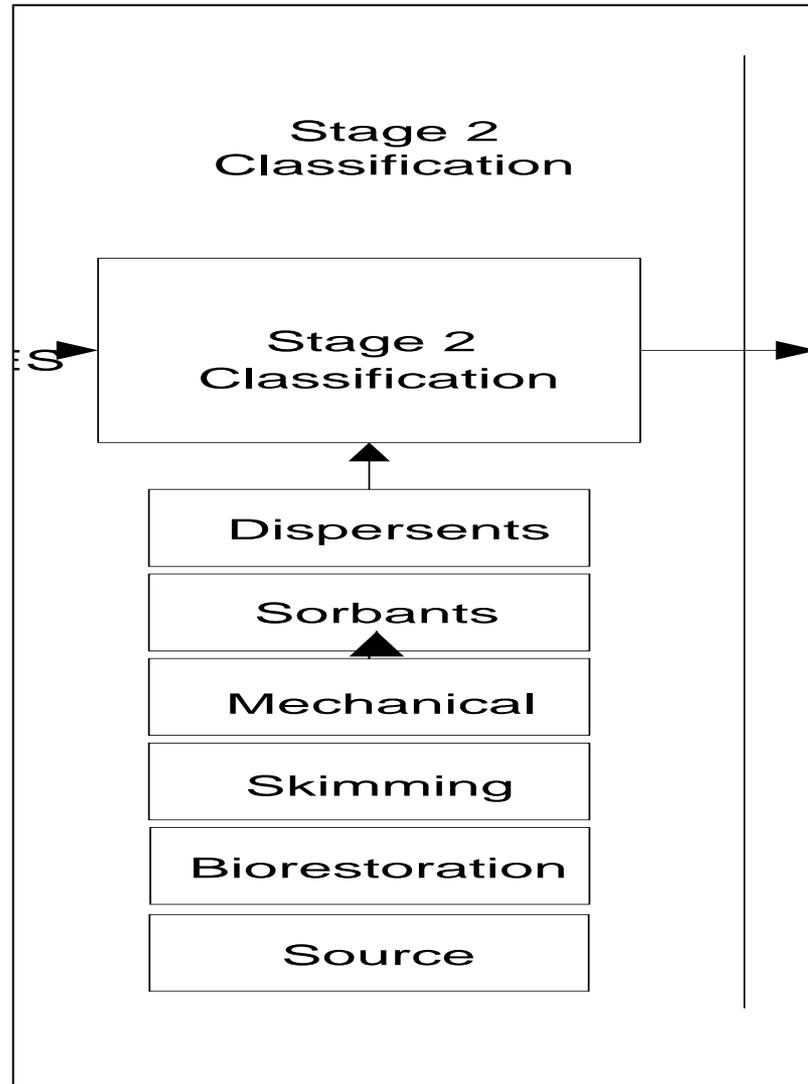
Many successful ideas recommended to the UAC

Significant impact from evaluated technologies

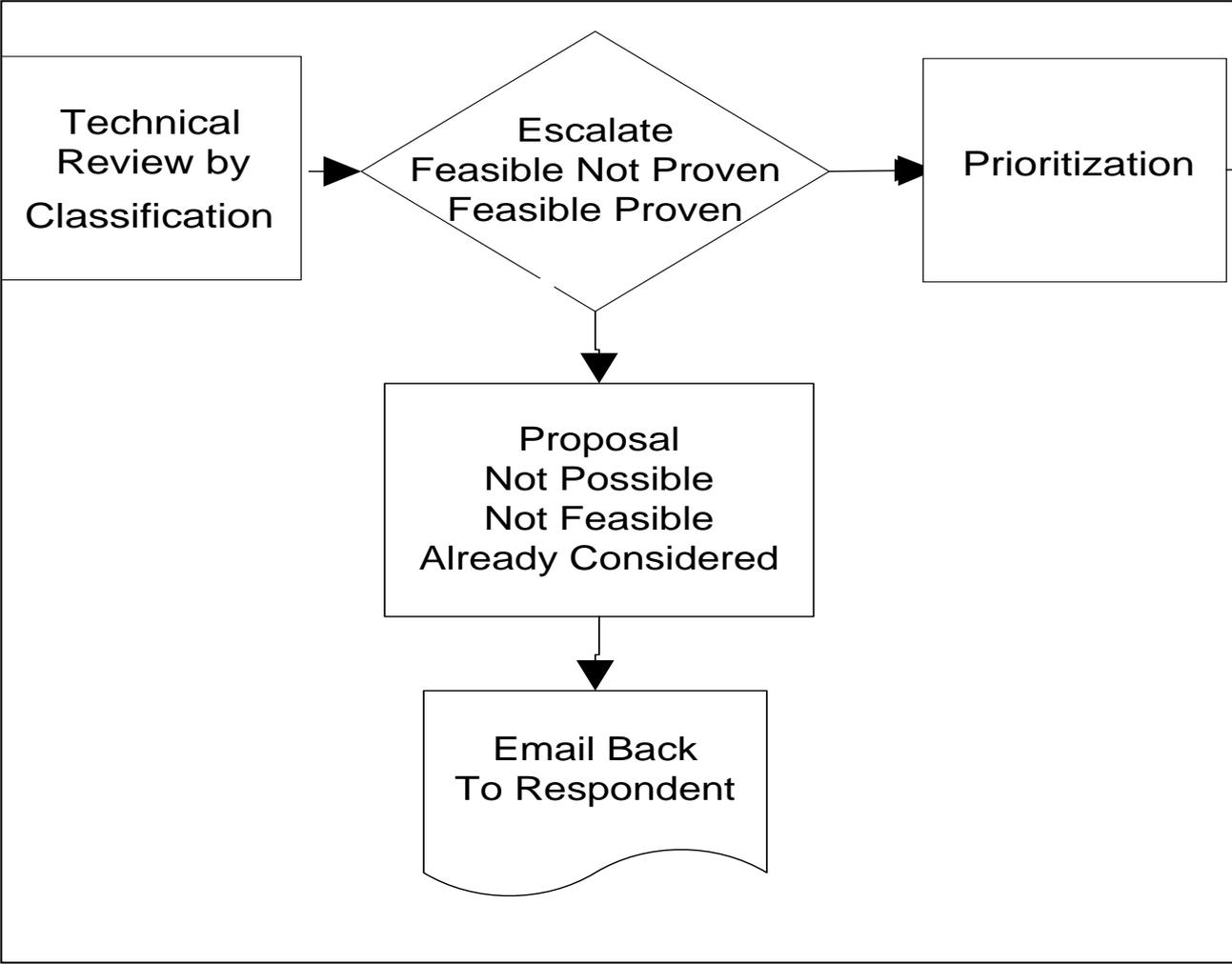
Triage Process: Stage 1 – Preliminary Evaluation



Triage Process: Stage 2 – Classification



Triage Process: Stage 3 – Technical Review by Classification



Triage Process: Stage 4 – Technical Review by Operations

