



Base mission of discovery science through high energy physics research since 1967

At Illinois Accelerator Research Center(IARC) we translate 50 years of accelerator research and innovation to address industry needs.

Energy I-Corps Cohort #7

Team PureBeam

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 NREL
NATIONAL RENEWABLE ENERGY LABORATORY

Innovation &
Entrepreneurship

 Innovation Showcase

PureBeam Waste Water Multitool Treats Contaminant X in Water

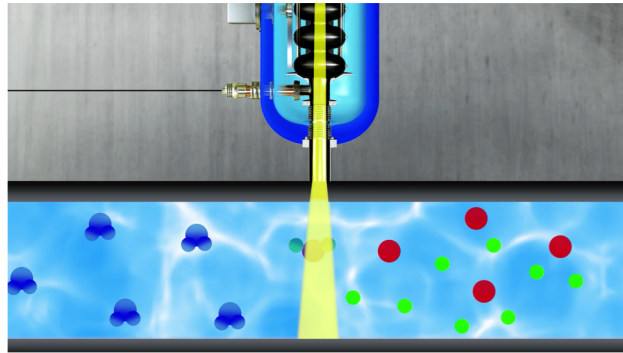
Our E-Beam technology treats your water contamination problems of today and tomorrow.

Military

- Explosives, PCBs, TCE
- Treat military PFCs problem today...
- ~200 military facilities
- \$Bs of emerging contaminants

Energy Production

- Point source contamination
- Total water re-use
- ~10,000 large processing facilities



Municipal

- Treat PFCs, pharmaceuticals, bacteria/viruses
- Quick to respond to EPA regulation
- > 16,500 public treatment facilities

Industrial

- Chemical manufacturing, textiles, medical
- Point source contamination
- Reduce/Re-use

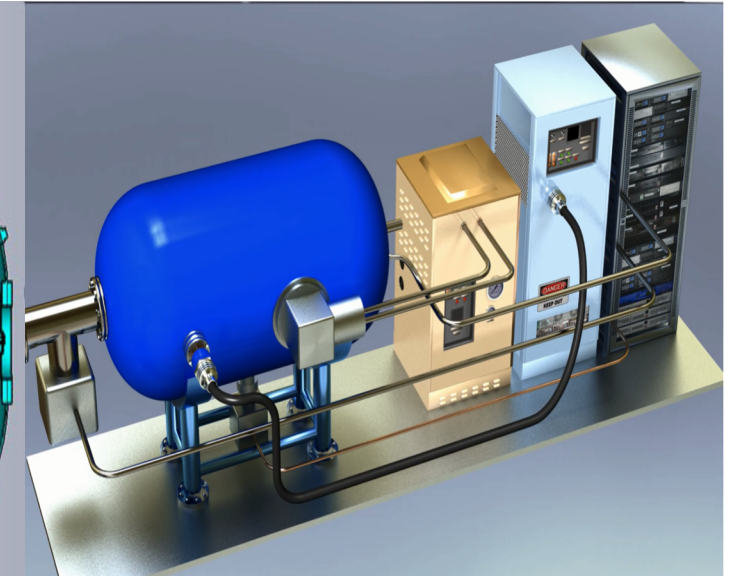
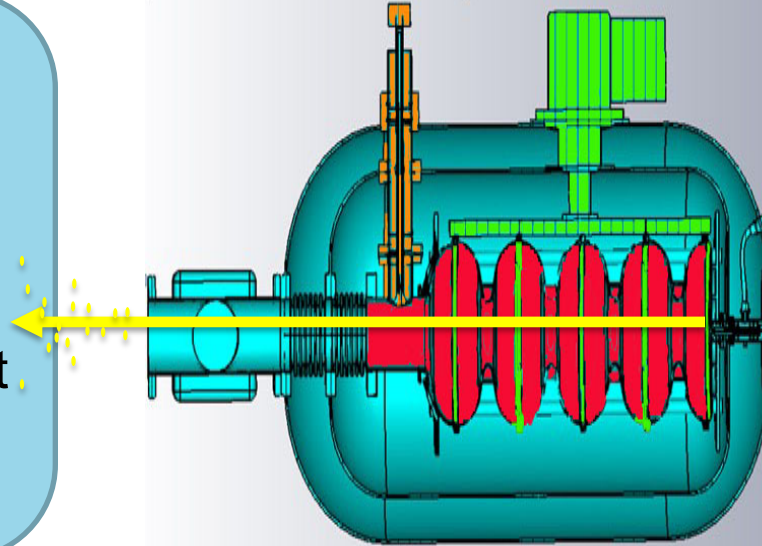
Food & Beverage

- Reduce/Re-use
- Condition incoming water
- Clean in place process

Novel E-Beam Accelerator for Water Treatment

Wastewater Multitool

- One tool to treat multiple contaminants
- Reduce treatment steps and complexity
- Treatment scalability without footprint expansion
- Resilient to emerging contaminants



Property	Advantage	E-Beam Improvement	Enabling Technology
High Power	High Throughput	200,000 – 500,000 gal/day (5X Improvement)	Superconducting
Compact	Portable, Integration into infrastructure	5ft by 7 ft by 13 ft (Shrunk from 3 Story Building)	Conduction Cooling
Energy Efficient	Reduced OpEx	30% less OpEx (50% less power)	RF Power Supply Superconducting

Solving the Military's Largest Wastewater Problem

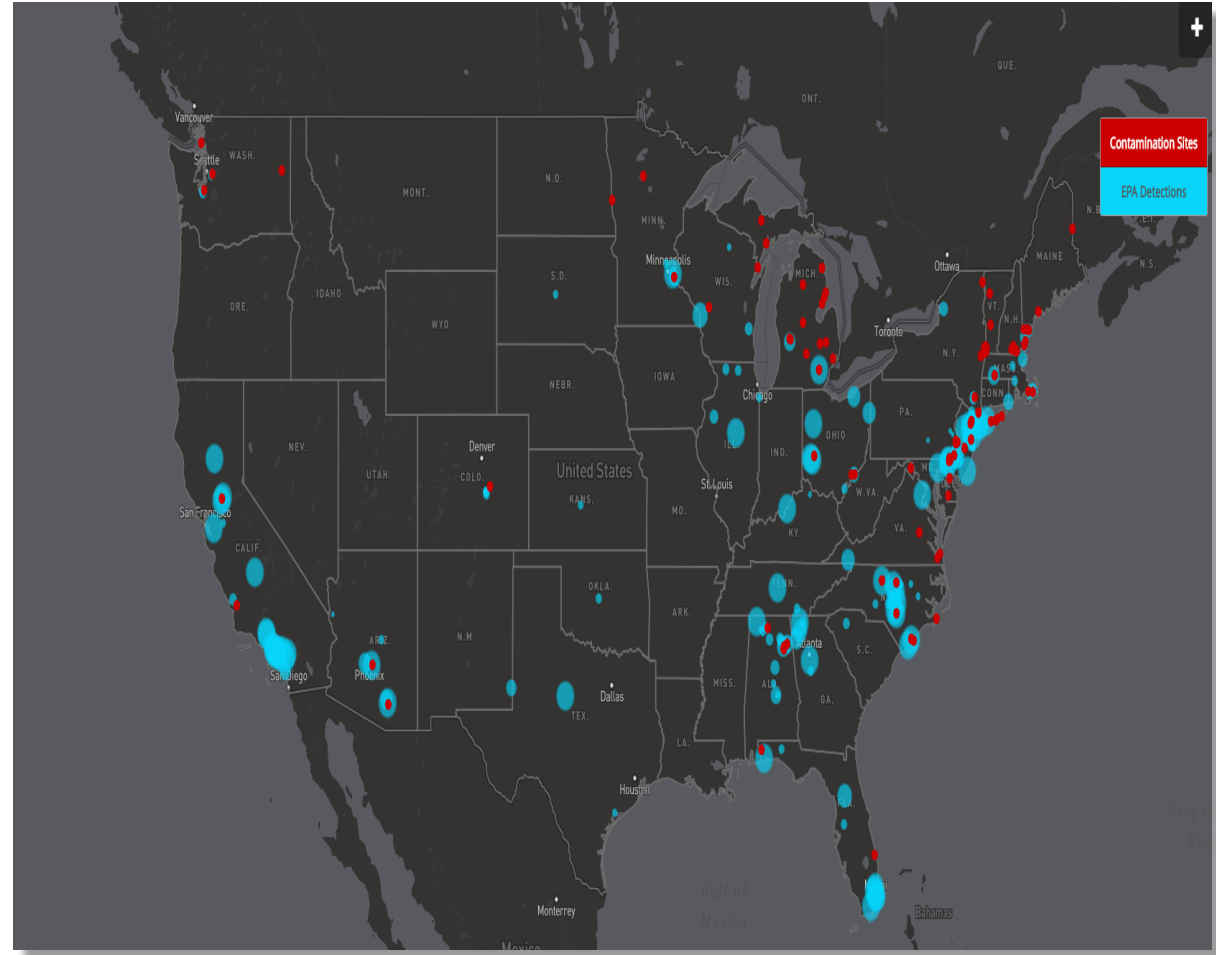
Our E-Beam technology enables military facility operations officers to meet EPA water guidelines as the only cost-effective solution that **destroys all** perfluorinated chemicals (PFCs) in high-flow water streams, allowing full real-time treatment of 100% of existing water treatment streams on-site.



“This is a red flag.” – Navy Civil Engineer

PFCs Extent of Problem

- Linked to public health issues
- 96% of those tested have in blood
- 4.4 year half life in body
- Over \$2 billion in settlements
- Kalamazoo, Mich. **Some residents are without drinking water** - PFC chemicals at more than 20 times the recommended limit.
- **Denver** is diluting and **using tainted well water supply** which is at 32 times the recommended perfluorate limit
- Congress pressuring EPA to establish enforceable standards



- 100's of Contaminated Military Installations
- 100's of Contaminated Water Municipalities

Market Competition for PFC Removal

Attribute	Pure Beam	Activated Carbon Filtration	Ion Exchange Resins	Membrane	Other Emerging
Remove PFOA/PFOS	✓	✓	✓	✓	✓
Remove short-chain PFCs	✓	✗	✗	✗	●
Destroys PFCs on-site	✓	✗	✗	✗	●
Treats PFCs in mixed-streams	✓	●	●	✓	✓
Cost to destroy PFCs	✓	✗	✗	✗	✗

Current PFC treatment issues

- Don't work on short chain PFCs
- Don't destroy the PFCs, only concentrate
- Expensive to destroy contaminant
- Emerging techniques are expensive and unproven

Military Market Size & Cost

- 600 military sites with detectable PFC levels
- **200 facilities need treatment** by today's standards
- Cost to treat with conventional technology
~\$500k per year, \$1.5M CapEx
- Cost to treat with PureBeam
~\$150k-300k per year, **\$4M CapEx**
- Cost parity 6-12 years



60% of nearby wells (totaling 1,621) tested above suggested limit

Timeline – Need Money to Fund Demonstration Unit

- **Process can be accelerated through additional funding**

