



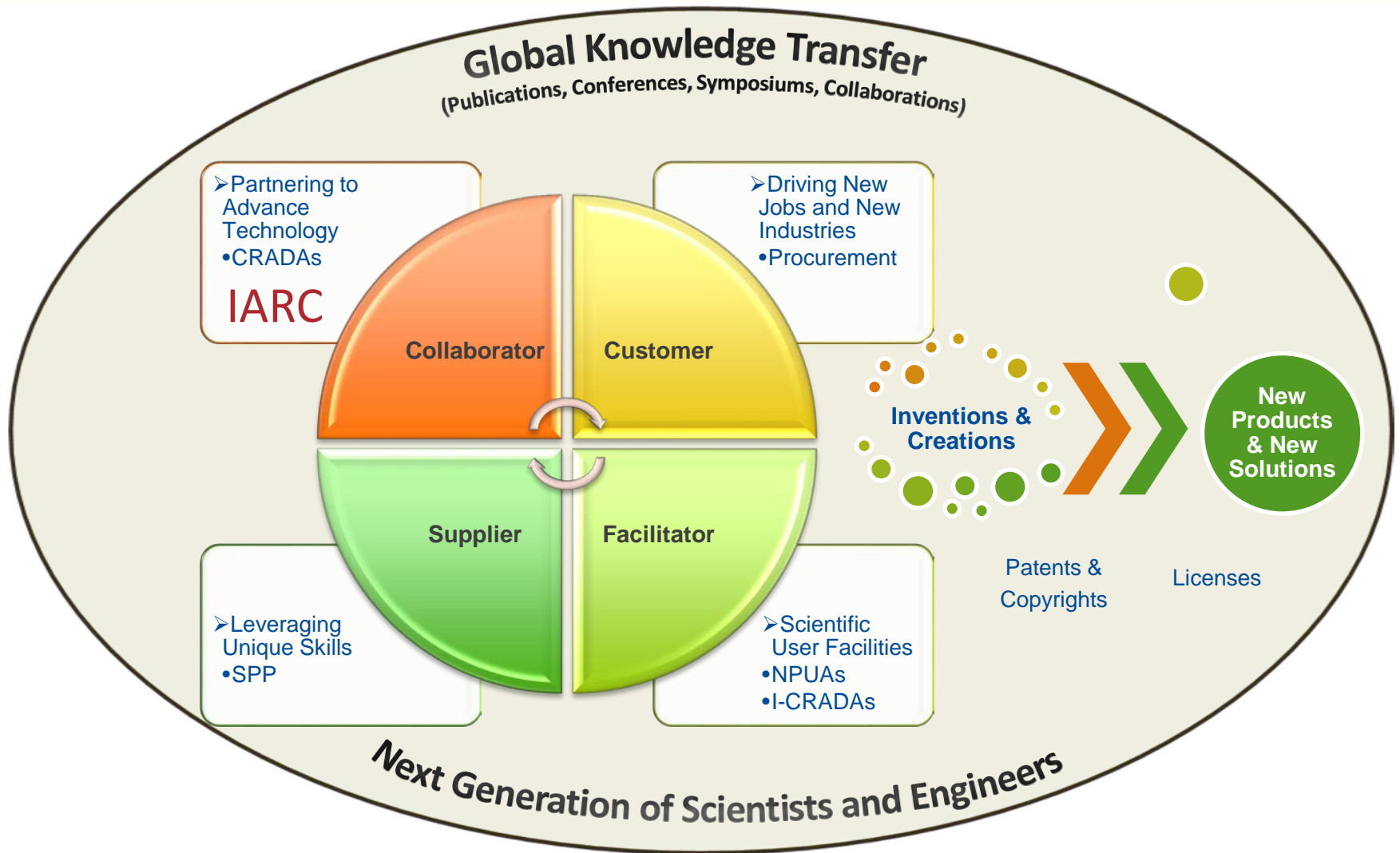
Managed by Fermi Research Alliance, LLC for the U.S. Department of Energy Office of Science

Partnerships and Technology Transfer: An Integrated Mission

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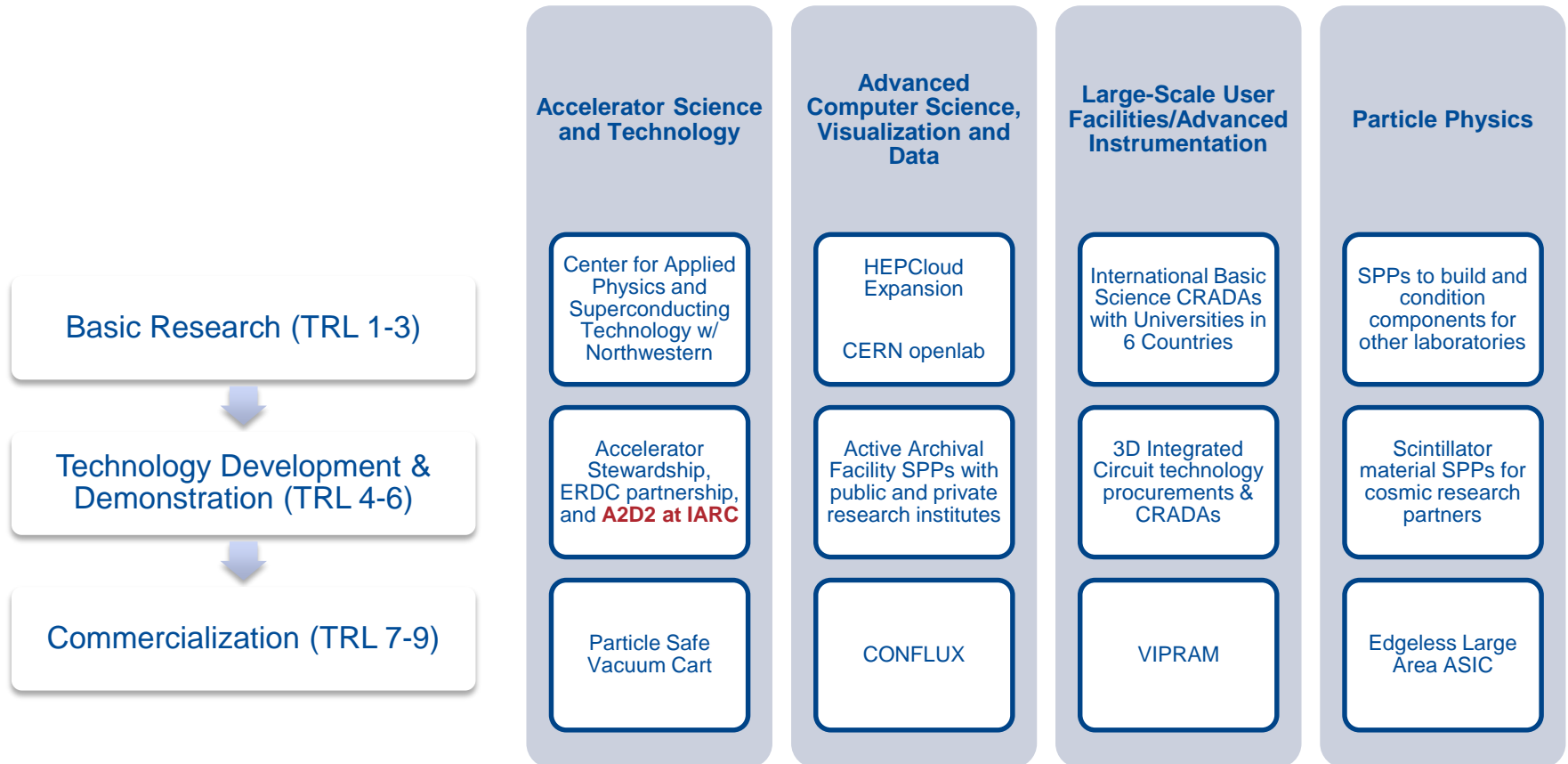
May 2018

Fermilab's technology transfer strategy: A holistic approach



Partnerships and Technology Transfer

Strengthen Core Capabilities

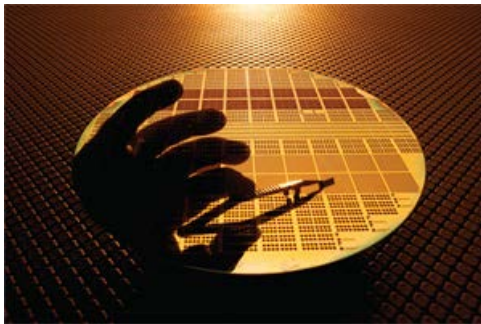


Fermilab's Technology Strengths



Accelerator Technology

Fermilab is the U.S. accelerator laboratory, dedicated to developing particle accelerators for physics research. This technology also has many applications outside of physics, including medical applications like PET scans and commercial applications like curing rubber tires or shrink-wrapping products. Through the Illinois Accelerator Research Center (IARC), Fermilab partners with industry and universities to help create accelerator-based products, applications, companies and jobs



Detector Technology

Accelerators can collide particles together, but scientists need detectors to reveal what happens when they do. Fermilab has been at the forefront of detector technology for decades, working most recently on the massive CMS detector at the Large Hadron Collider in Switzerland and the next generation of neutrino detectors for experiments in the U.S. The technologies developed for these physics experiments can be applied to fields as diverse as the financial industry and medical diagnostics.



Computing Technology

Particle physics experiments produce an enormous amount of data. It takes an extraordinary amount of computing power to sift through that data and find the one signal in a billion that could tell us more about our universe. Fermilab's computing innovations have led to multiple applications, driven by our need to process massive amounts of information, store it and transmit it effectively.

Illinois Accelerator Research Center (IARC)

Mission

To partner with industry to exploit technology developed in the pursuit of science to create the next generation of industrial accelerators, products, and new applications.

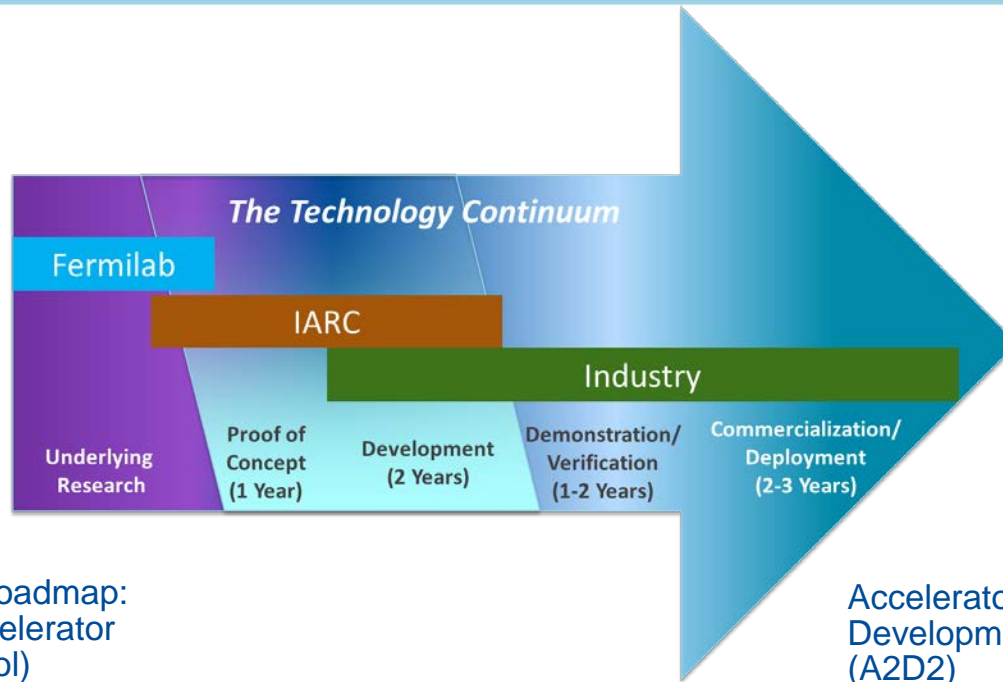
Joint DOE- Illinois DCEO Project



Vision

To be the preeminent technology source for accelerator based products and services, serving as the seed for US industrial growth.

IARC: Bridging the Gap from TRL3 to TRL6



The Technology Roadmap:
Compact SRF Accelerator
(Fermilab Multi-Tool)

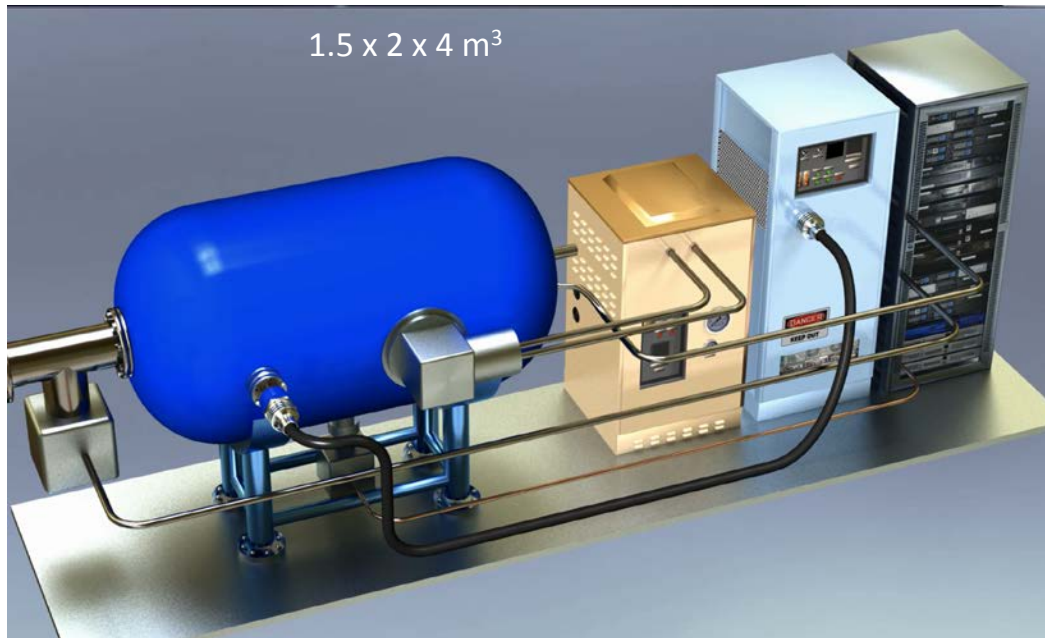
Accelerator Applications
Development & Demonstration
(A2D2)

- Technology Push Strategy
- Five key enabling technologies
- Scale from science to industry



- Market Pull Strategy
- Feasibility studies for partners
- Illuminate the return on investment

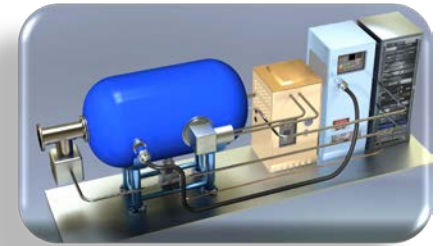
Technology Roadmap: Compact SRF-Based Accelerator



- Energy: ~ 10 MeV
- Power: 250 KW – 1MW
- Simple and compact
- Affordable

- 650 MHz elliptical cavity with integrated gun
- Magnetron RF source with low loss coupler
- Commercial cryo-cooler with conduction cooling
- Modular design scales to MW class industrial applications
- Accelerator system <3000 lbs → **mobile** applications

Technology Roadmap



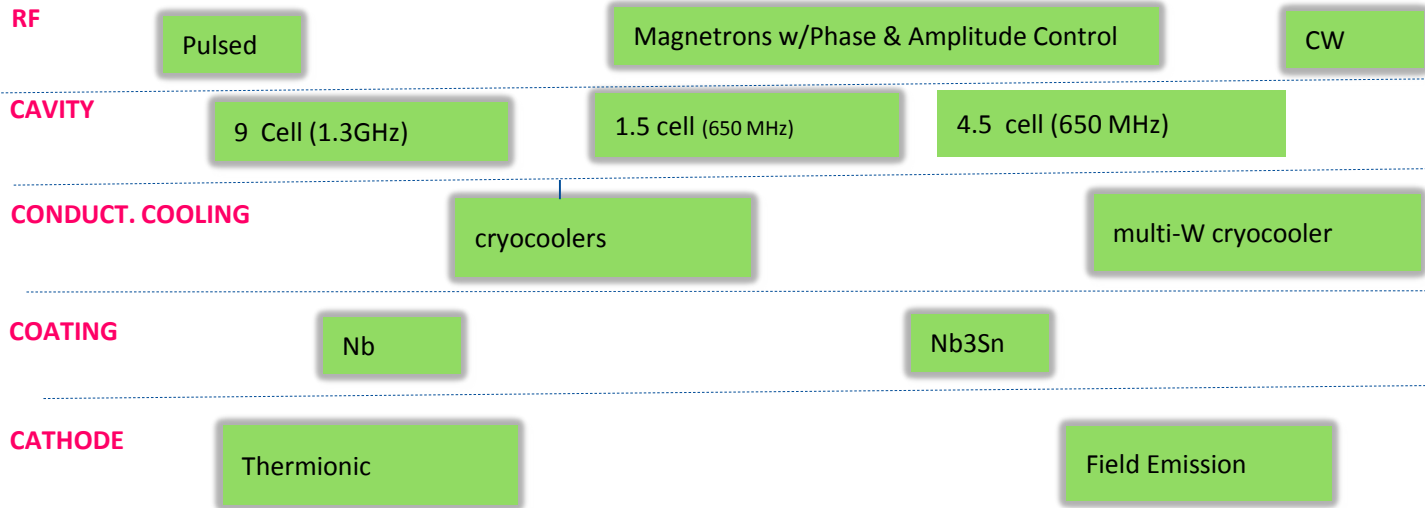
Industry Partners

Radiabeam Euclid CPI CCR Integration Partners

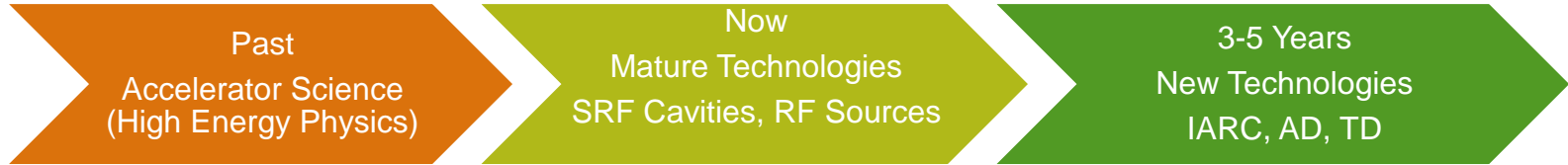
Research Partners

DOE-SC NIU UofC UMD NNSA ERDC DOE-AMO DOT

Technologies



Technology push



Initiatives & Opportunities: A Different Kind of Map



Initiative: Pavement and Coating Applications



Opportunities

- Improved Pavement Performance
- Special Purpose Coatings (Anti-Skid, Corrosion Resistant, Chemical Resistant)
- Heavy-Duty Thick Film Industrial Coatings

Funding

- SBIR/STTR & Accelerator Stewardship Funding
- LDRD Funding for Conduction Cooling
- Received 1.94M from ERDC for FY17/FY18

Partners

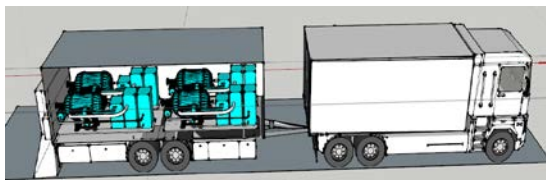
- ERDC (Interagency Agreement)
- Large materials manufacturer (CRADA pending)
- DOT (developing partnership)
- NAVSEA and ARL (under discussion)

Status

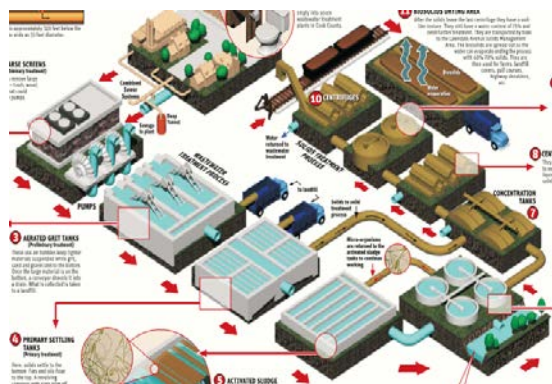
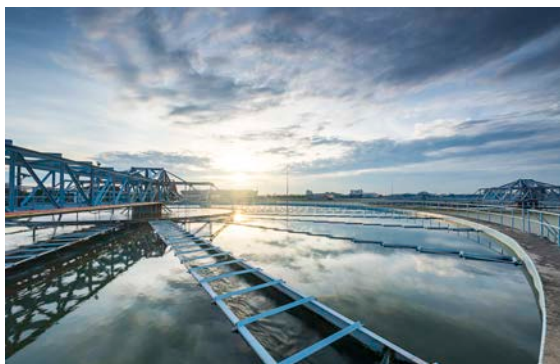
- IARC's technology R&D is well under way
- ERDC is collecting materials for sample program
- A2D2 is operational and has treated 1st samples

Near Term Goals

- Deliver on first year commitments to ERDC
- Deliver on LDRD commitments
- 1st Prototype Nov 2019 (1.5 cell, 650 MHz, 30 kW)



Initiative: Water Resources



Chicago Metropolitan Water Reclamation District (MWRD)

Opportunities

- Remove toxic species in domestic water (pharmaceuticals, agricultural run off)
- Remove PCBs, MTBE, other organic & halogenated industrial contaminants
- Remove nitrates from waste streams

Funding

- \$250K FY16 Accelerator Stewardship Funding for 1 MW accelerator design w/MWRD
- \$200K FY18 Accelerator Stewardship Funding to extend design to 10 MW accelerator
- Sample Program CRADAs (internally funded)

Partners

- Metropolitan Water Reclamation District
- ERDC (under Sample Program CRADA)
- Milwaukee Metropolitan Sewer District (developing partnership)
- NSF, Florida Atlantic Univ, & The Water Council

Status

- 10 MW accelerator design in progress
- Planning MWRD/ERDC sample programs
- Working with MMSD to define a “proof of principle” study on PCB degradation in water/soil

Near Term Goals

- Host NSF Workshop in May on e-beam treatment of water w/FAU and Water Council
- Complete 10MW accelerator design study
- Perform FY18 MWRD/ERDC sample programs

Initiative: Food & Medical Device Sterilization



Opportunities

- Replacing Co-60 for medical device sterilization
- In-situ treatment of quarantined crops
- Field-deployable sterilization systems (aircraft carriers, forward operating bases)

Funding

- \$300K from NNSA for study of accelerator-driven sterilization to replace Co-60

Partners

- National Nuclear Security Agency (NNSA)
- Active interest from large e-beam service providers
- Major medical instruments firm (end-user interest)
- NAVY (preliminary interest)

Status

- Completed Phase I study for NNSA
- Presenting results at multiple FY18 meetings
- Phase II proposal in process

Near Term Goals

- Secure Phase II study funding from NNSA
- Submit R&D proposal to NNSA for system design
- Launch business development campaign for food irradiation (USDA, DHS, DOD, state agencies)



Initiative: Energy



Opportunities

- Flue-gas treatment
- Superconducting generators for wind turbines
- High energy x-ray source and detector for wellbore inspection (patent pending)

Funding

- Pursuing funding from DOE's Technology Commercialization Fund (TCF)
- Requires 50% cost-match from industry partner

Partners

- Small downhole equipment manufacturer (NDA)
- Large, foreign-owned energy firm is very interested (possible export control issue)
- Shell GameChangers is another potential partner

Status

- Proposal submitted for TCF Funding
- Export control license application in process

Near Term Goals

- Secure TCF award for proof of concept and preliminary design work

Thank you!

