Committee on Radiation Sources and Alternative Technologies

The National Academies of Sciences, Engineering, and Medicine
Public meeting
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Implementing e-beam and X-ray as alternative technologies : a review of some industrial use cases

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Mevex Corporation

About Mevex : Company profile

The company

Established 1987
130+ people
Canada, Europe and Asia
100+ beams installed

Technology

Linac-based E-beam
and X-ray systems
Conveyor systems
Robotics
Advanced process control

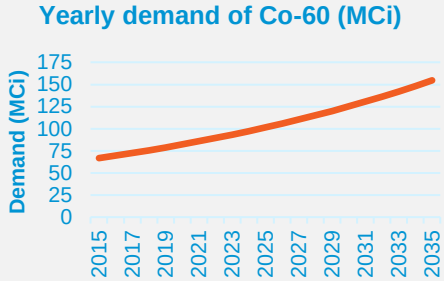
Applications

Sterilization
Food irradiation
Advanced materials
R&D
Gem stones
Semi-conductors

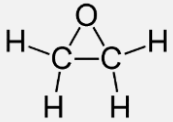
What drives growth of industrial e-beam and X-ray systems?

1 Increased demand

Growth of Disposable Medical Devices

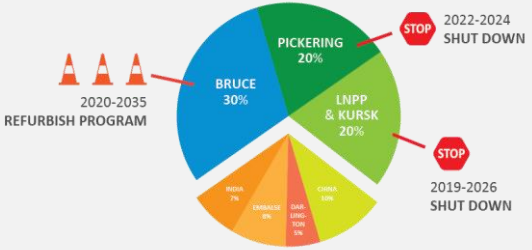


Ethylene Oxide



2 Limited supply

Shortage of Co-60 supply



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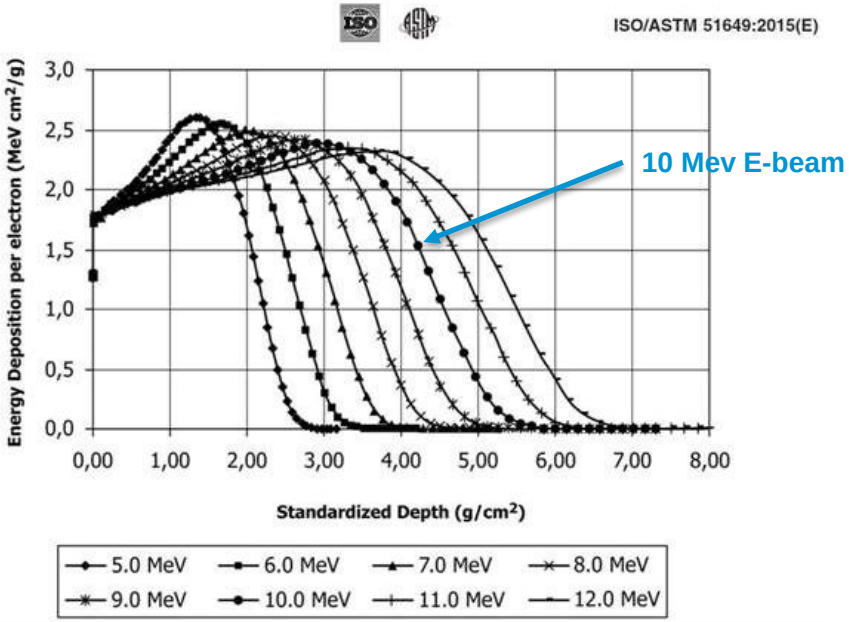
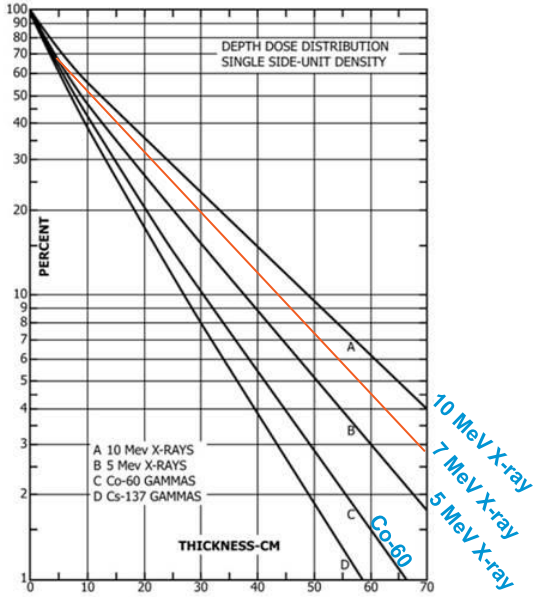
E-beam, X-ray and gamma penetration properties

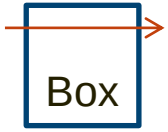
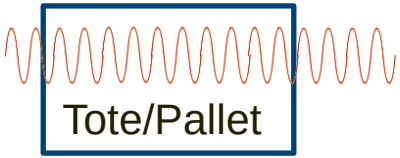
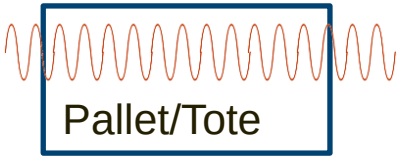




NOTE 1—Percentage depth-dose distribution in water or unit-density materials for single-sided irradiation: (*A*) 10 MeV X-rays; (*B*) 5 MeV X-rays; (*C*) ^{60}Co gamma rays; and (*D*) ^{137}Cs gamma rays.

FIG. A1.7 Depth dose distributions (Fig. 1 from Ref (9))

Industrial irradiation technologies compared

	Source	Penetration	Dose uniformity	Energy Efficiency
8-12 MeV **Ebeam** (Beta)				
Cobalt 60 (Gamma)				
7,5 MeV **X-ray**				

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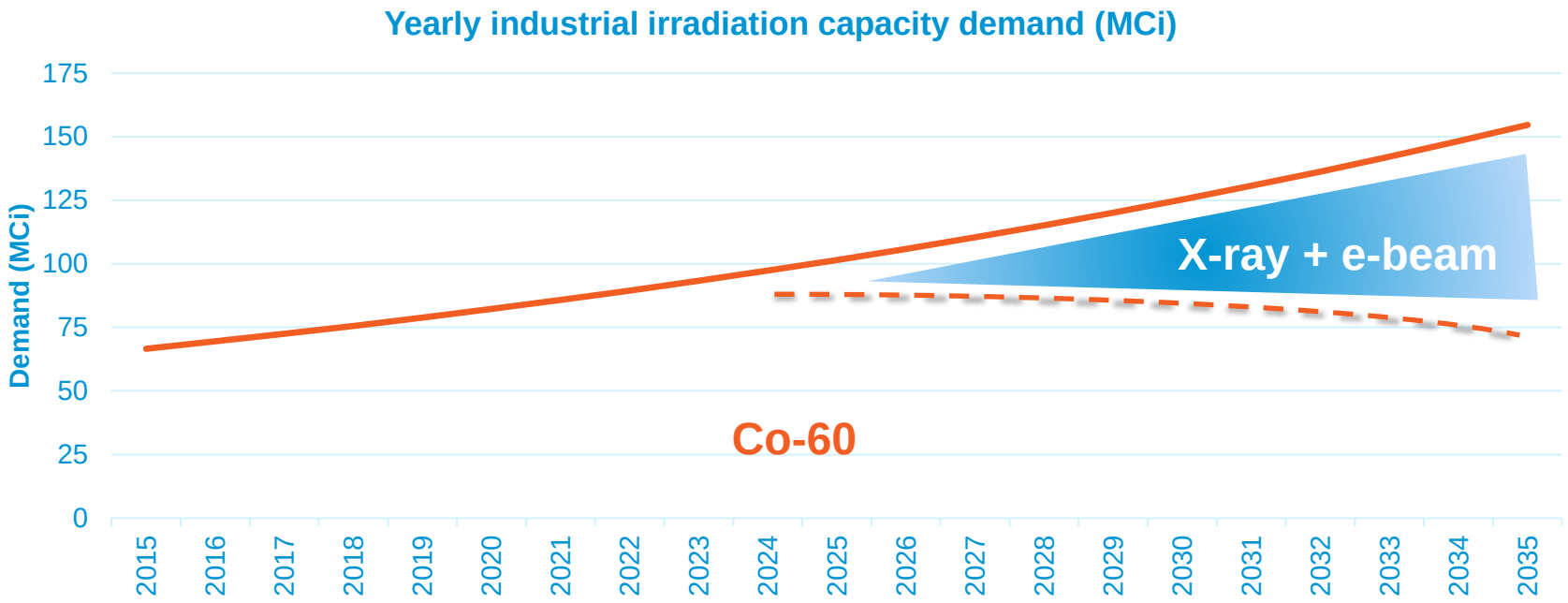
Total Radiation Processing Capacity Requirements



Use case review agenda

1. **R&D for university**
   X-ray-in-a-box as alternative to Gamma Cell 220

2. **Medical cannabis**
   Migration from Gamma to e-beam

3. **Food irradiation**
   Migration from Gamma to X-ray

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USE CASE 1:

X-RAY FOR UNIVERSITY AS AN ALTERNATIVE TO GAMMA CELL 220

X-ray for R&D

Texas A&M University
National Center for Electron Beam Research/NNSA
National Center for Low Energy Electron Beam Research

Target use of the X-ray system:

- Food and agriculture R&D
- X-Ray studies for Medical Device Companies
- Sterile Insect technology (SIT)

National Center for Electron Beam Research




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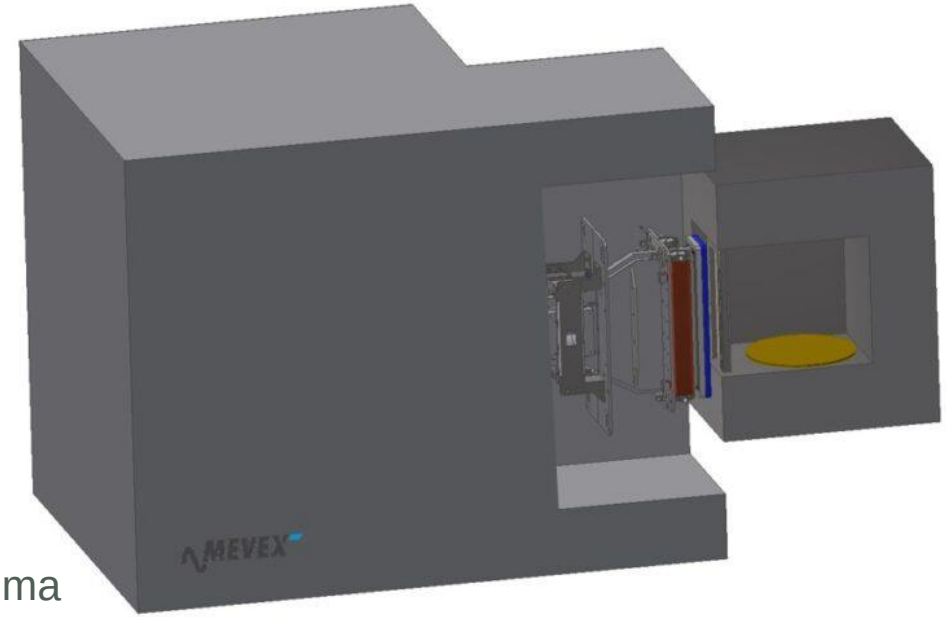
« X-ray in a box »

- Steel shield
- Manual product loading
- 1 – 2 MeV
- E-beam and X-ray
- Max 30 x 30 x 30 cm products
- 550 – 650 sq ft footprint
- Low activity equivalent solution
- Supports product migration from gamma to X-ray



USE CASE 2 :

MEDICAL CANNABIS : MIGRATION FROM GAMMA TO E-BEAM

Cannabis producer : From Gamma to E-beam

Use to treat Cannabis with Gamma

Motivation to switch :

1. Transport costs
2. Security transporting products
3. Turn around time
4. Irradiation costs

The need:

- In-house selfshielded e-beam
- Continuous processing

MB 5000 overview

- Continuous processing
- Steel shielding
- Fits in existing buildings
- Box or tray processing
- 1600 – 2200 sq ft footprint

USE CASE 3:

FOOD IRRADIATION : MIGRATION FROM GAMMA TO X-RAY

From Gamma to X-ray

- Steritech Australia
- 80% of business is food irradiation
- Facing Co-60 shortage and increasing costs
- Needs to treat products on pallets
- Invested into X-ray to add reliable capacity next to gamma

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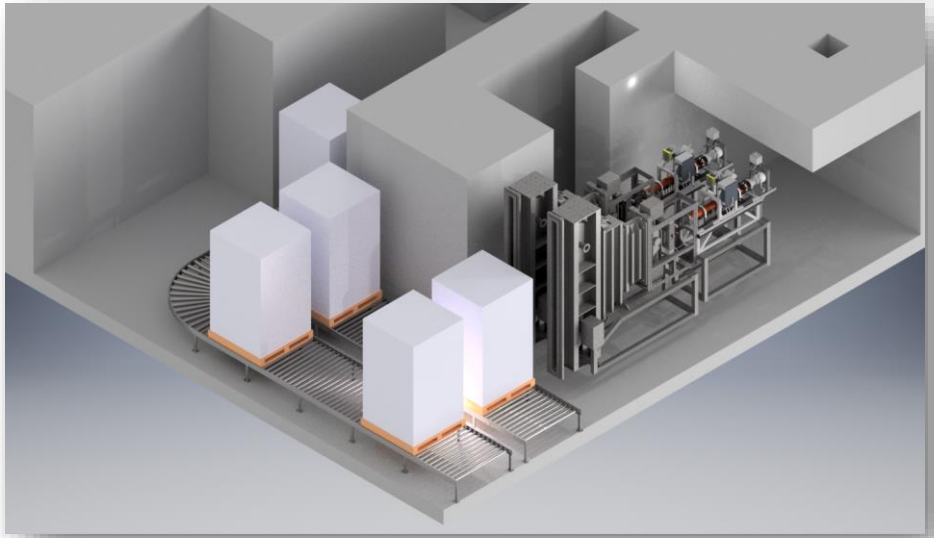
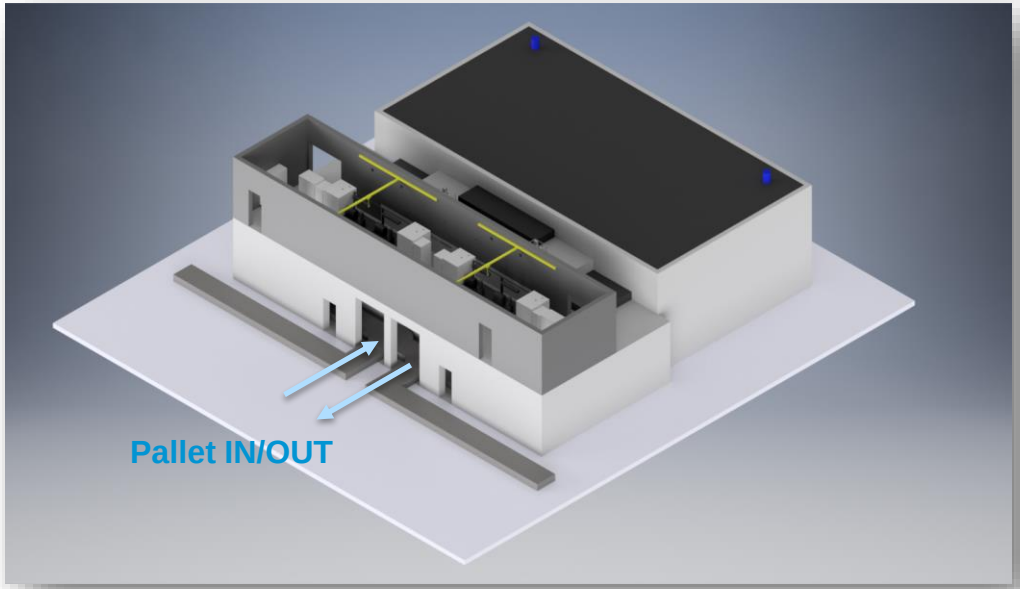
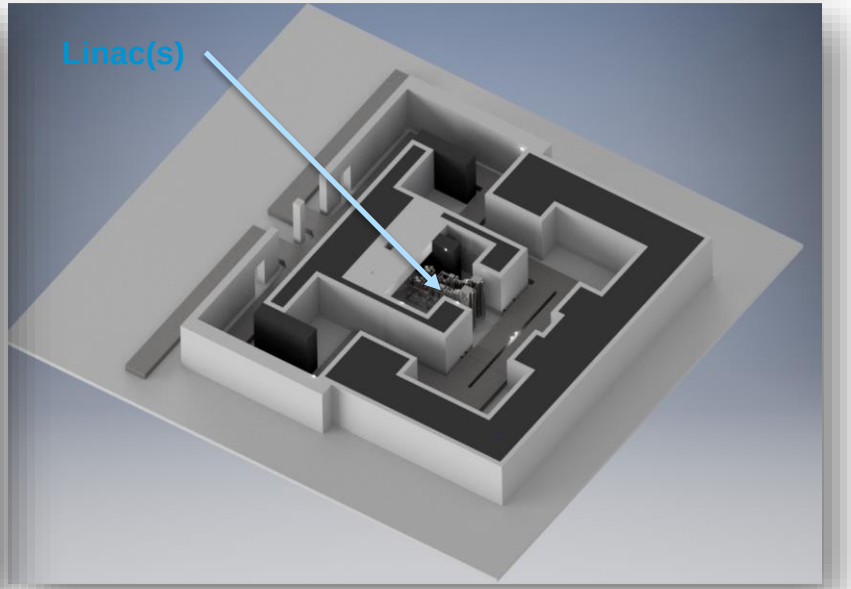
E-beam and X-ray processing

- Pallet conveyor
- 5 or 7,5 MeV X-ray
- 10 MeV for e-beam
- Concrete shield
- 4300 – 5400 sq ft footprint
- Million Curie Co-60 equivalent system



X-ray Pallet System





THANK YOU