RADIOACTIVE WASTE:
SOURCES & CHARACTERISTICS

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Prepared For:
AMERICAN SOCIETY of
MECHANICAL ENGINEERS
1991 RADWASTE SHORT COURSE
May 6, 1991
RADWASTE SOURCES AND CHARACTERISTICS

FROM:
"RADWASTE GENERATION SURVEY UPDATE"
EPRI NP-5526
PUBLISHED FEBRUARY 1988
1987-88 VOLUMES UPDATED JANUARY 1989
1989 VOLUMES UPDATED JANUARY 1990
REPRESENTS MORE THAN 90% OF OPERATING UNITS DURING RESPECTIVE PERIODS

LOW-LEVEL WASTE STREAMS

- DRY ACTIVE WASTE
- WET PROCESS WASTES
- MISC./ATYPICAL WASTES
  - \( ^{96} \text{Kr} \) IN REGULATION TOOLS

DRY ACTIVE WASTE COMPOSITION

- COMPACTED WASTE
  MATERIALS COMPRESSED FOR VR VIA DRUM OR BOX COMPACTION (ON-SITE OR OFF-SITE)
  TYPICALLY CONSISTS OF PLASTIC, PAPER, PVC, ABSORBENTS, CLOTH, SMALL NON-COMPACTIBLES, ETC.

- NONCOMPACTED WASTE
  MATERIAL NOT TYPICALLY COMPACTED PRIOR TO DISPOSAL
  TYPICALLY CONSISTS OF WOOD, PIPES, VALVES, TOOLS, DIRT, CONCRETE, CONDUIT, FILTERS, ETC.

1988-1989
COMPACTED WASTE COMPOSITION
PWR: PLANT AVERAGE

- PAPER (17%)
- CLOTH (10%)
- RUBBER (4%)
- WOOD (3%)
- NON-COMP (1%)
- METAL (2%)
- FILTERS (2%)
- GLASS (1%)
- MISC (4%)

1988-1989
NONCOMPACTED WASTE COMPOSITION
PWR: PLANT AVERAGE

- PIPE/VLV (34%)
- FILTERS (12%)
- COMP MT (4%)
- FVF FR (2%)
- CONCRETE (2%)
- TOOLS (4%)
- DIRT (1%)
- LEAD (1%)
- GLASS (1%)
- WOOD (1%)
- MISC (18%)

* CAN BE DECONTAMINATED

* SHIPPED, BY VOLUME
DRIY WASTE SOURCES

- NORMAL OPERATIONS
- OUTAGE CONDITIONS

GENERATION TYPICALLY 3 - 4 TIMES GREATER DURING OUTAGE CONDITIONS
DRY WASTE CHARACTERISTICS

- COMPACTED DAW
  - AVG ISOTOPIC DISTRIBUTION
  - AVG SPECIFIC ACTIVITY
  - AVG CONTACT RADIATION LEVEL
**WET WASTE COMPOSITION**

**WASTES FROM LIQUID PROCESSING**
- BEAD RESIN
- POWDERED RESIN / SLUDGES
- EVAPORATOR CONCENTRATES
- MISC WET WASTES

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**WET WASTE COMPOSITION**

**PWR AVERAGE (1988-89)**

- POWDERED RESIN (48%)
- EVAPORATOR CONCENTRATES (28%)
- BEAD RESIN (24%)
- OIL (3%)
- MISC (2%)

* CPS: PRIMARY-TO-SECONDARY LINKS

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**WET WASTE COMPOSITION**

**BWR AVERAGE (1988-89)**

- POWDERED RESIN (54%)
- EVAPORATOR CONCENTRATES (34%)
- BEAD RESIN (7%)
- OIL (2%)
- MISC (3%)

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**WET WASTE COMPOSITION**

**PWR AVERAGE ANNUAL WET WASTE COMPOSITION: ALL PWRs**

- MISC
- OIL
- POWDER
- BEAD
- CONC

* RCP OIL DOMINANT

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**BWR AVERAGE ANNUAL WET WASTE COMPOSITION: ALL BWRs**

- MISC
- OIL
- BEAD
- CONC
- POWDER

* SCALE OILS DOMINANT
**WET WASTE SOURCES**

**LIQUID PROCESSING SYSTEMS**

**BWRs**
- Reactor Water Clean-Up
- Condensate Polishing
- Spent Fuel Pool Cooling
- Radwaste
  - High Purity (Equip. Drains)
  - Low Purity (Floor Drains)
  - Chemical (Decn., Recken Soln.)
  - Detergent (Laundry)

**PWRs**
- Reactor Coolant
- Condensate Polishing
- Spent Fuel Pool Cooling
- Boron Recovery
- Steam Generator Blowdown
- Radwaste
  - Misc. Waste (Floor & Equip. Drains)
  - Chemical (Decn., Recken Soln.)
  - Detergent (Laundry)

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**BWR WET WASTE SOURCES**

<table>
<thead>
<tr>
<th>PROCESSING SYSTEM</th>
<th>BEAD RESIN</th>
<th>POWDERED RESIN/SLUDGE</th>
<th>EVAPORATOR CONCENTRATES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reactor Water Clean-Up</td>
<td>6%</td>
<td>7%</td>
<td>6%</td>
</tr>
<tr>
<td>Condensate Polishing</td>
<td>30%</td>
<td>41%</td>
<td>2%</td>
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<tr>
<td>Spent Fuel Pool Cooling</td>
<td>3%</td>
<td>2%</td>
<td>83%</td>
</tr>
<tr>
<td>Liquid Radwaste</td>
<td>52%</td>
<td>50%</td>
<td>15%</td>
</tr>
<tr>
<td>Chem Wastes</td>
<td></td>
<td></td>
<td>2%</td>
</tr>
<tr>
<td>Other</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TOTAL %</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
</tr>
</tbody>
</table>

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**PWR WET WASTE SOURCES**

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<tr>
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<th>BEAD RESIN</th>
<th>POWDERED RESIN/SLUDGE</th>
<th>EVAPORATOR CONCENTRATES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reactor Coolant System</td>
<td>17%</td>
<td></td>
<td>High Specific Activity</td>
</tr>
<tr>
<td>Condensate Polishing</td>
<td>20%</td>
<td>87%</td>
<td></td>
</tr>
<tr>
<td>Spent Fuel Pool Cooling</td>
<td>4%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boron Recovery</td>
<td>3%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Steam Generator Blowdown</td>
<td>4%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Liquid Radwaste</td>
<td>52%</td>
<td>47%</td>
<td></td>
</tr>
<tr>
<td>Chem Wastes</td>
<td>9%</td>
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<td></td>
</tr>
<tr>
<td>Other</td>
<td>13%</td>
<td>52%</td>
<td></td>
</tr>
<tr>
<td>TOTAL %</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
</tr>
</tbody>
</table>

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**WET WASTE CHARACTERISTICS**

- BWR - Powdered Resin Sludge
- PWR - Bead Resin
  - Avg Isotopic Distribution
  - Avg Specific Activity
  - Avg Contact Radiation Level

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**BEAD RESIN SPECIFIC ACTIVITY**

**PWR: Plant Average**

| PRIMARY | 1.05 Curie/Cu Pt |
| NON-PRIMARY | 0.30 Curie/Cu Pt |

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**POWDERED RESIN SLUDGE SPECIFIC ACTIVITY**

**PWR: Plant Average**

| PRIMARY | 1.2 Curie/Cu Pt |
| NON-PRIMARY | 0.3 Curie/Cu Pt |

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**BEAD RESIN ISOPTIC DISTRIBUTION**

**PWR: Plant Average**

- Ca 137 (27%)
- Ca 134 (19%)
- Ca 60 (20%)
- Ca 58 (19%)
- Others (19%)

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**POWDERED RESIN SLUDGE ISOPTIC DISTRIBUTION**

**PWR: Plant Average**

- Ca 137 (11%)
- Ca 134 (14%)
- Ca 60 (21%)
- Ca 58 (19%)
- Others (19%)

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**BEAD RESIN CONTACT RADIATION LEVEL**

**PWR: Plant Average**

- PRIMARY: 51.5 Rm
- NON-PRIMARY: 2 Rm

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**POWDERED RESIN SLUDGE CONTACT RADIATION LEVEL**

**PWR: Plant Average**

- PRIMARY: 452 Rm
- NON-PRIMARY: 2 Rm
TYPICAL PLANT WASTE VOLUMES

BWR & PWR DISPOSAL VOLUMES

- ANNUAL AVERAGES
- PER UNIT BASIS
- AVERAGE PLANT
- MEDIAN PLANT
- BY WASTE STREAM

INDUSTRY RADWASTE TRENDS

BWR & PWR DISPOSAL VOLUMES

- 1978 THROUGH 1989
- AVG CU FT PER UNIT-YEAR
- TOTAL WASTE - AVG / MEDIAN PLANT
This is disposal trend not as "generated"