THE NRC AND MIXED OXIDE FUEL

ACRS Briefing
Tim Johnson
February 2, 2001

NRC's ROLE IN MOX

- Overview
- The Licensing Process
- NEPA
- Public Hearings
- Public Participation
- Issues
- Activities to Date / Schedule

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A BRIEF HISTORY

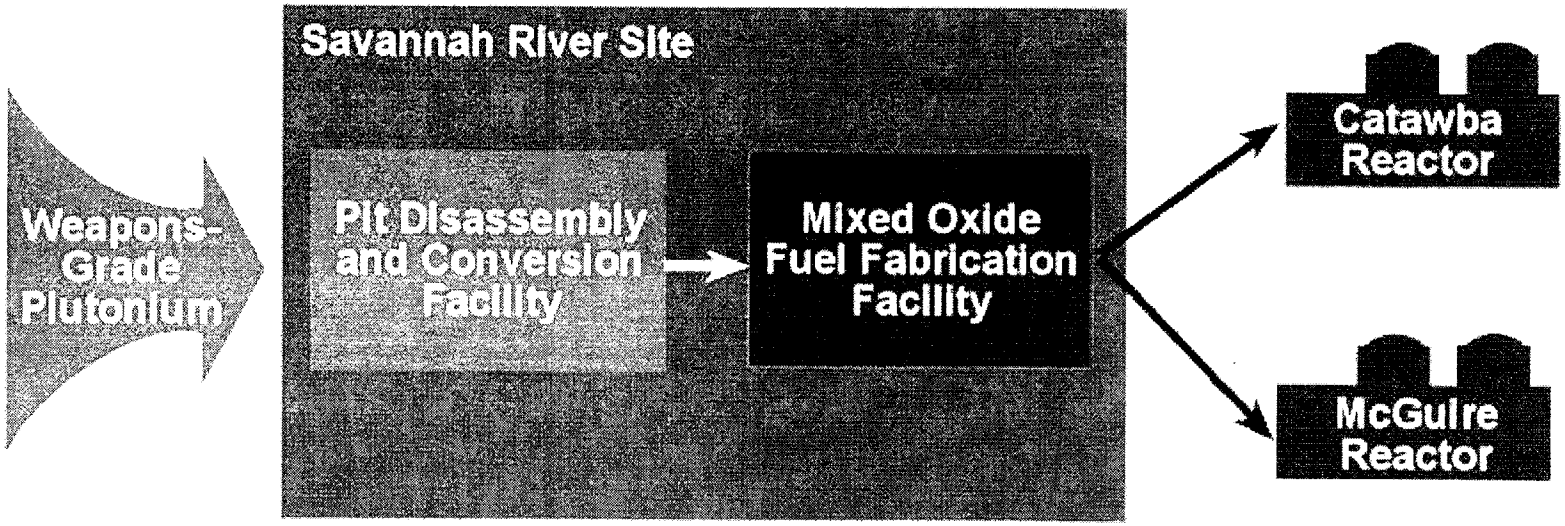
- Agreement with Russia

- Reduce the spread of nuclear weapons

A BRIEF HISTORY

- DOE hybrid approach
  - Convert approximately 25 metric tons plutonium to MOX fuel;
  - Immobilize approximately 9 metric tons plutonium;
  - Fabricate the MOX fuel at Savannah River site;
- Contract to license, build and operate the MOX fuel plant -Duke Cogema Stone & Webster (DCS)

NRC Role in Regulating Mixed Oxide Fuel



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MOX FUEL FABRICATION PROCESS

Overview

- Aqueous polishing
  - Remove impurities
  - Based on process at La Hague in France
- Fuel fabrication
  - Mixing, blending, pelletizing, sintering, grinding, fuel rod / fuel bundle assembly
  - Based on process at MELOX in France

THE NRC LICENSING PROCESS

AREAS OF NRC REVIEW

- Fuel fabrication
- Transportation
- Reactors
- Spent fuel disposal

ACTIVITIES REQUIRING NRC APPROVAL

Fuel Facility

- Two-stage licensing process
  - Construction
  - Operation

CONSTRUCTION

Fuel Facility

- Content of construction application -10 CFR 70.22(f)
  - Site description
  - Safety analysis of the design bases
  - Quality assurance program
- Approval of construction application
  - 10 CFR 70.23(a)(7), 70.23(a)(8), 70.23(b)

OPERATION

Fuel Facility
10 CFR 70.22 and 70.65

- Safety analysis
- Safety equipment / operator actions
- Management measures
- Emergency plan
- Physical protection plan
- Material accounting plan

NATIONAL ENVIRONMENTAL POLICY ACT (NEPA)

ENVIRONMENTAL IMPACT STATEMENT (EIS)

- Required for major federal actions

- Licensing the fuel fabrication facility pursuant to 10 CFR Part 51

DOE's EIS

Previous NEPA Work By DOE

- DOE EIS for MOX
- Record of Decision
- Link to NRC EIS

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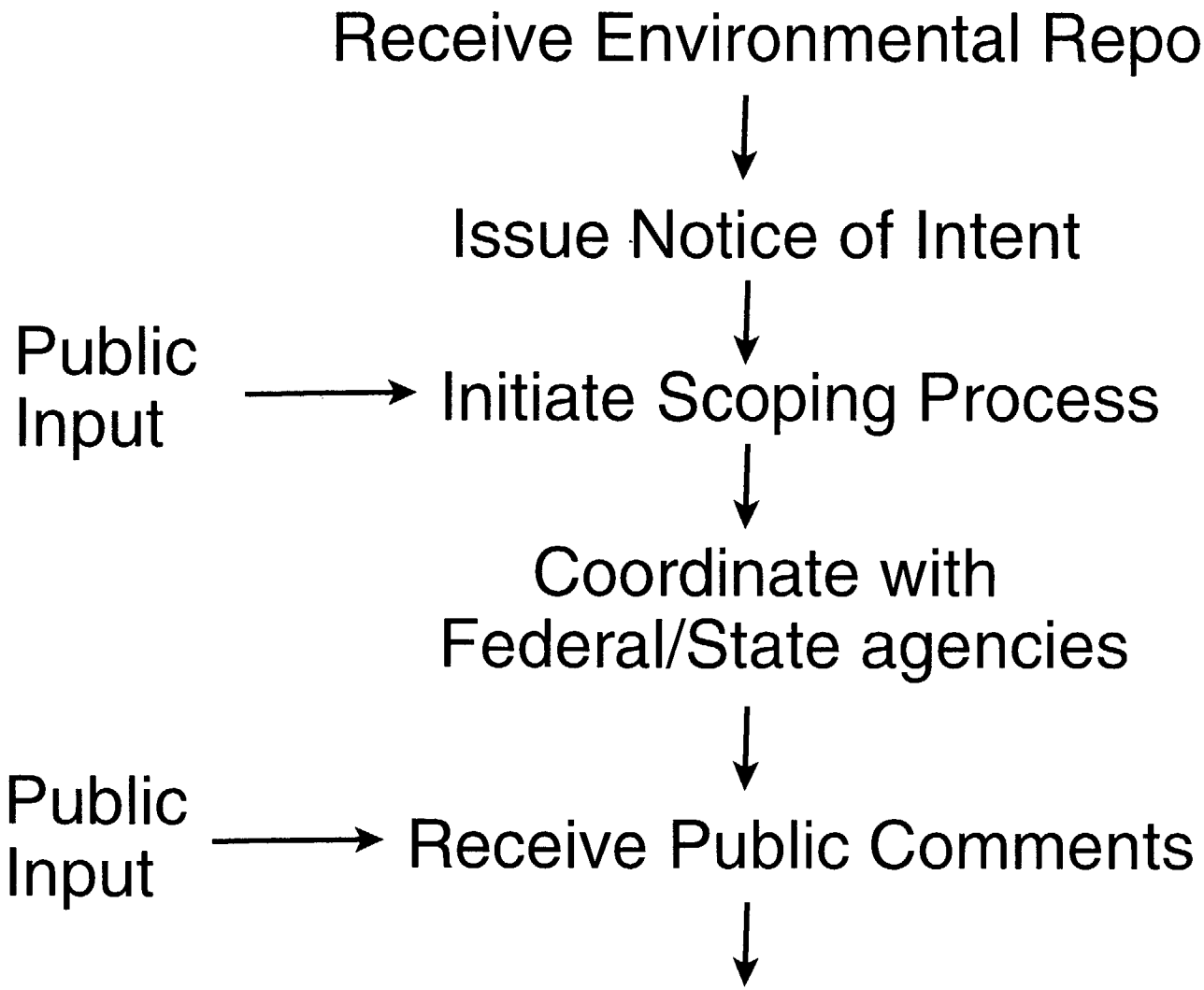

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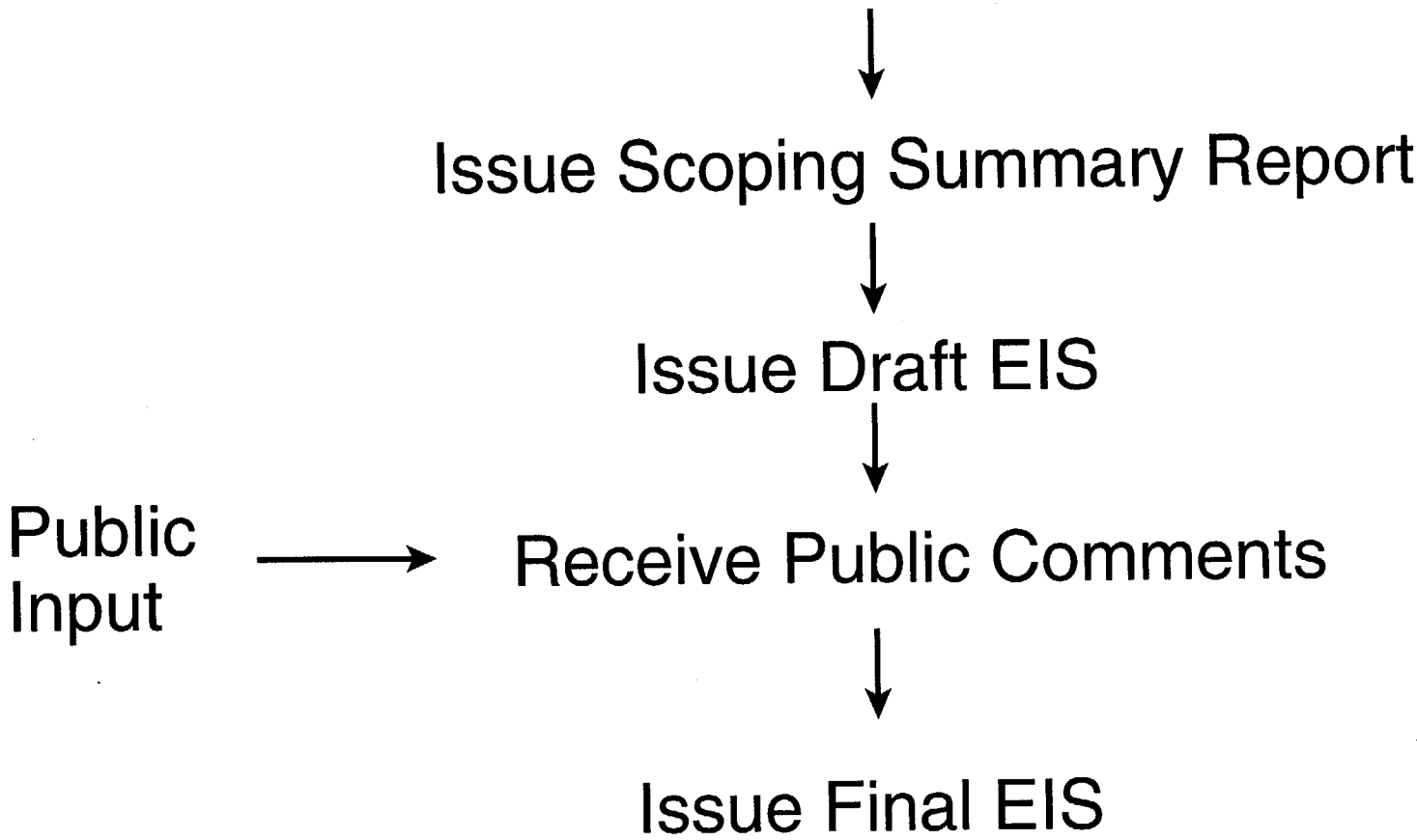

HEARINGS

PUBLIC HEARINGS

- Two opportunities for hearing
  - Construction authorization stage
  - Operating approval stage

- 10 CFR Part 2, Subpart L-Informal Hearings

PUBLIC PARTICIPATION

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- Communications plan completed in December 2000
- NEPA
  - Scoping meetings; public comments
- Opportunities for hearings
- Periodic public meetings
- MOX website
  - http://www.nrc.gov/NRC/NMSS/MOX/index.html
- MOX newsletter
- ADAMS

ISSUES

- Technical issues
- Lead test assemblies
- DOE security-related MOU
- First application of revised Part 70
- Subpart L public hearings

ACTIVITIES TO DATE / SCHEDULE

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- Standard Review Plan for MOX fuel facility (NUREG-1718) completed August 2000
- MOX website online October 2000
- Technical meetings
- Public meetings in South Carolina in July 2000

SCHEDULE

Fuel Facility

- Environmental report received 12/19/00
- Application for construction authorization fuel fabrication facility expected February 2001
- Start of construction of fuel fabrication facility assuming favorable SER scheduled in September 2002
- Operating license application fuel fabrication facility expected June 2002

SCHEDULE

Reactors

- Amendments for use of MOX lead test assemblies (LTAs) expected August 2001
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- License amendment application to use MOX fuel (other than LTAs) in McGuire/Catawba reactors expeced January 2004
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REGULATORY EFFECTIVENESS OF THE ANTICIPATED TRANSIENT WITHOUT SCRAM (ATWS) RULE

BY
BILL RAUGHLEY
GEORGE LANIK

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DIVISION OF SYSTEMS ANALYSIS AND REGULATORY EFFECTIVENESS
REGULATORY EFFECTIVENESS ASSESSMENT AND HUMAN FACTORS BRANCH

BACKGROUND

- **Draft Report, "Regulatory Effectiveness of the ATWS Rule" for internal and external comment**

- **ATWS definition and effects**

  -Initiating event frequency
  -Reliability of the reactor protection system (RPS)
  -Reliability of ATWS mitigation systems

- **ATWS rule historical considerations**

  -Considerable uncertainty in frequency and consequences
  -BWR and PWR ATWS events
  -Technical basis and regulatory analysis

- **ATWS Rule 10 CFR 50.62 and Commission recommendations**

  -Modifications to improve capability to prevent and mitigate an ATWS
  -Reduce the number of automatic scrams and improve RPS reliability

ASSESSMENT

- **Regulatory Effectiveness**

  -SBO assessment used as the template
  -A regulation is effective if expectations are being achieved

- **Scope**

  -Is the ATWS rule effective and if any areas need attention
  -Plant specific problems not addressed

- **Method**

  -Compared the expectations to the outcomes using objective measures in areas of risk, value-impact, modifications, and operating limits
  -Expectations from NRC documents
  -Outcomes from NRC PRA/IPE databases, LERs, NRC surveys, and NRC reliability studies

RESULTS

- **Hardware modifications and operating limitations implemented**

  -All PWRs installed diverse means to trip turbine and initiate auxiliary feedwater
  -CE and B&W PWRs installed a diverse scram system (DSS)
  -Westinghouse low unfavorable exposure time (UET), no DSS
  -BWRs installed diverse recirculation pump trip, alternate rod insertion circuitry, high capacity standby liquid control; upgrade EOPs

- **Mean frequency of automatic scram decreased**

  -From 4 scrams per reactor year since 1983 to 0.5 since 1997 accounts for one order magnitude reduction in expected frequency of an ATWS

- **RPS reliability expectations met using data since 1984**

  -Reactor trip breaker (RTB) failures persist along with industry efforts to address

- **Frequency of an unmitigated ATWS or P(ATWS) <1.0E-05**

- **Costs less than expected due to fewer spurious scrams**

COMMENTS

- **Stakeholder Comments**

  -Internal NRC comments
  -External stakeholders including:
  - Union of Concerned Scientists
  - Westinghouse Owners Group
  - General Electric
  - CE Owners Group

- **More significant comments**

  -risk approach too simplistic
  -scram reduction not considered in value-impact outcome
  -PWR ATWS peak pressure sensitivity to relief capacity important
  -MTC/UET, steam generator tube issues
  -fuel management issues need more emphasis
  -operator action should have more credit

- **Each comment will be addressed**

CONCLUSIONS

- ATWS rule was effective in installing modifications and reducing risk; and was implemented at reasonable cost.

- Uncertainties in RPS reliability and mitigative capability need to be fully considered in risk-informed regulatory changes.

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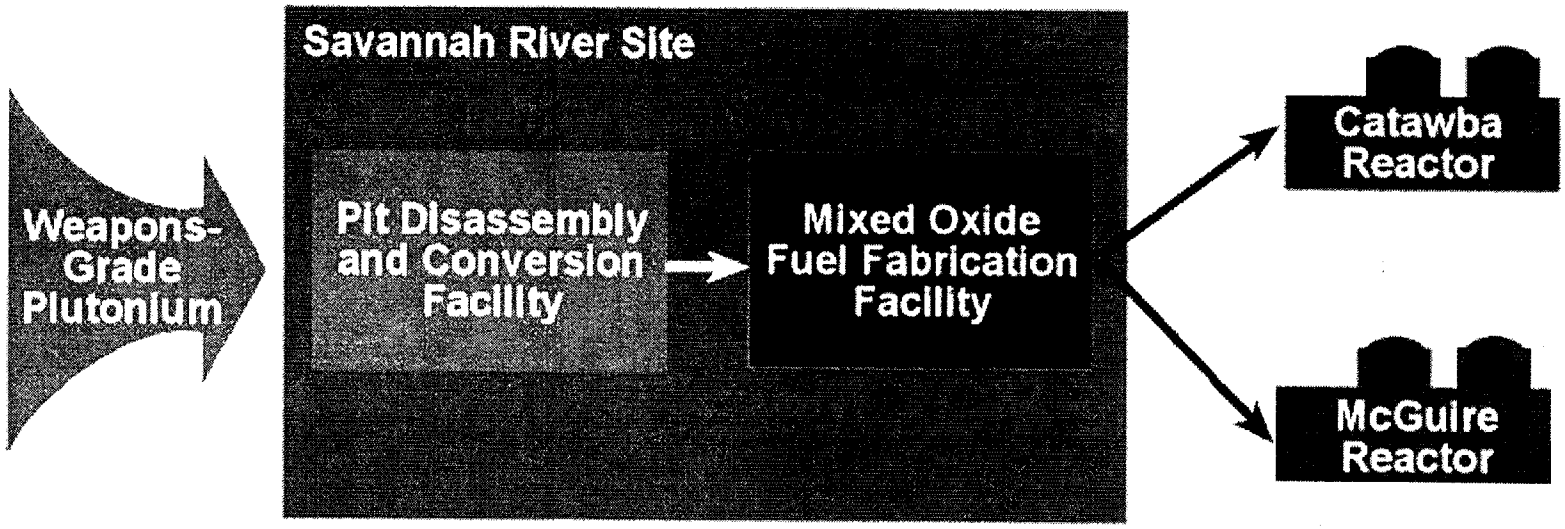

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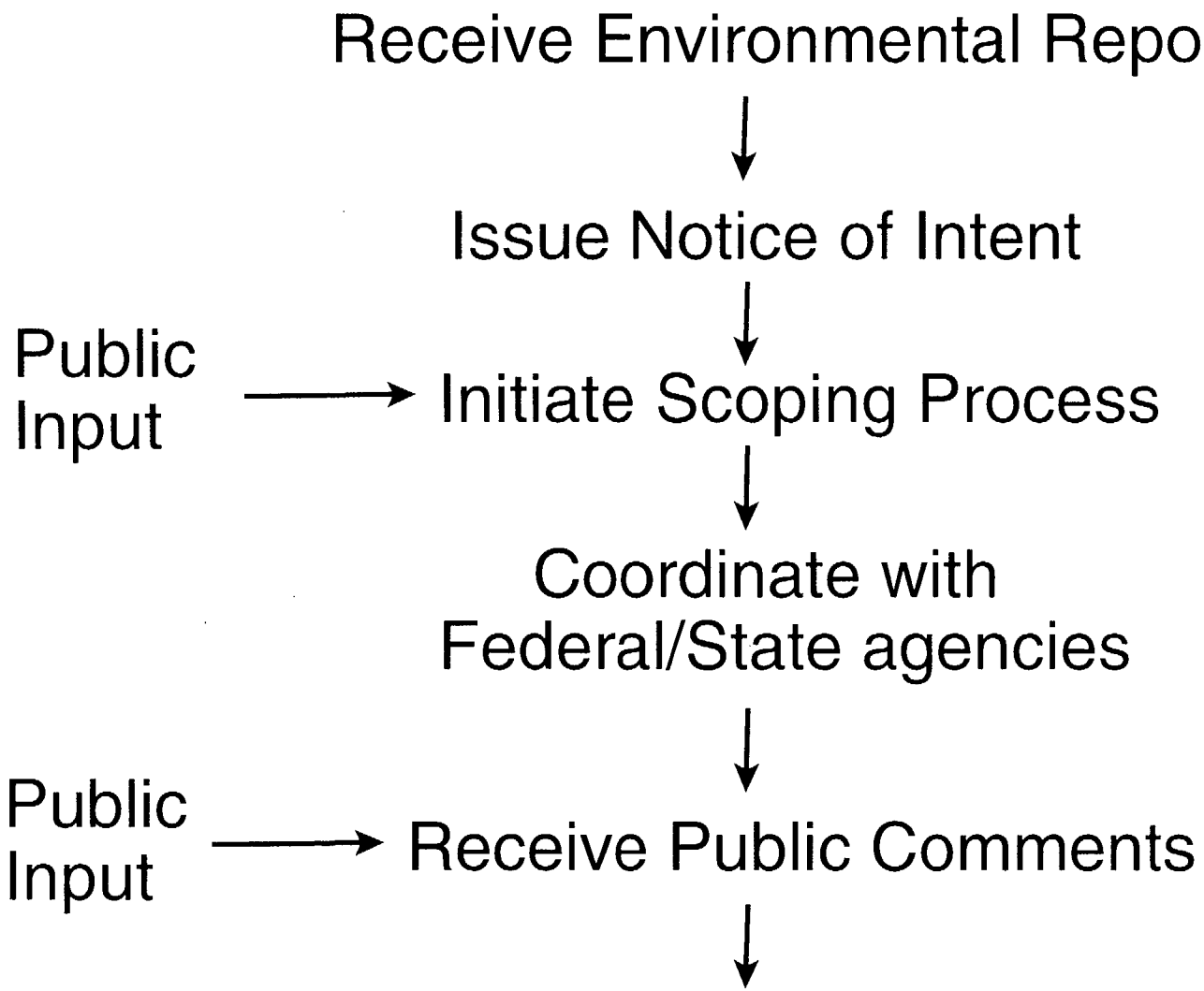

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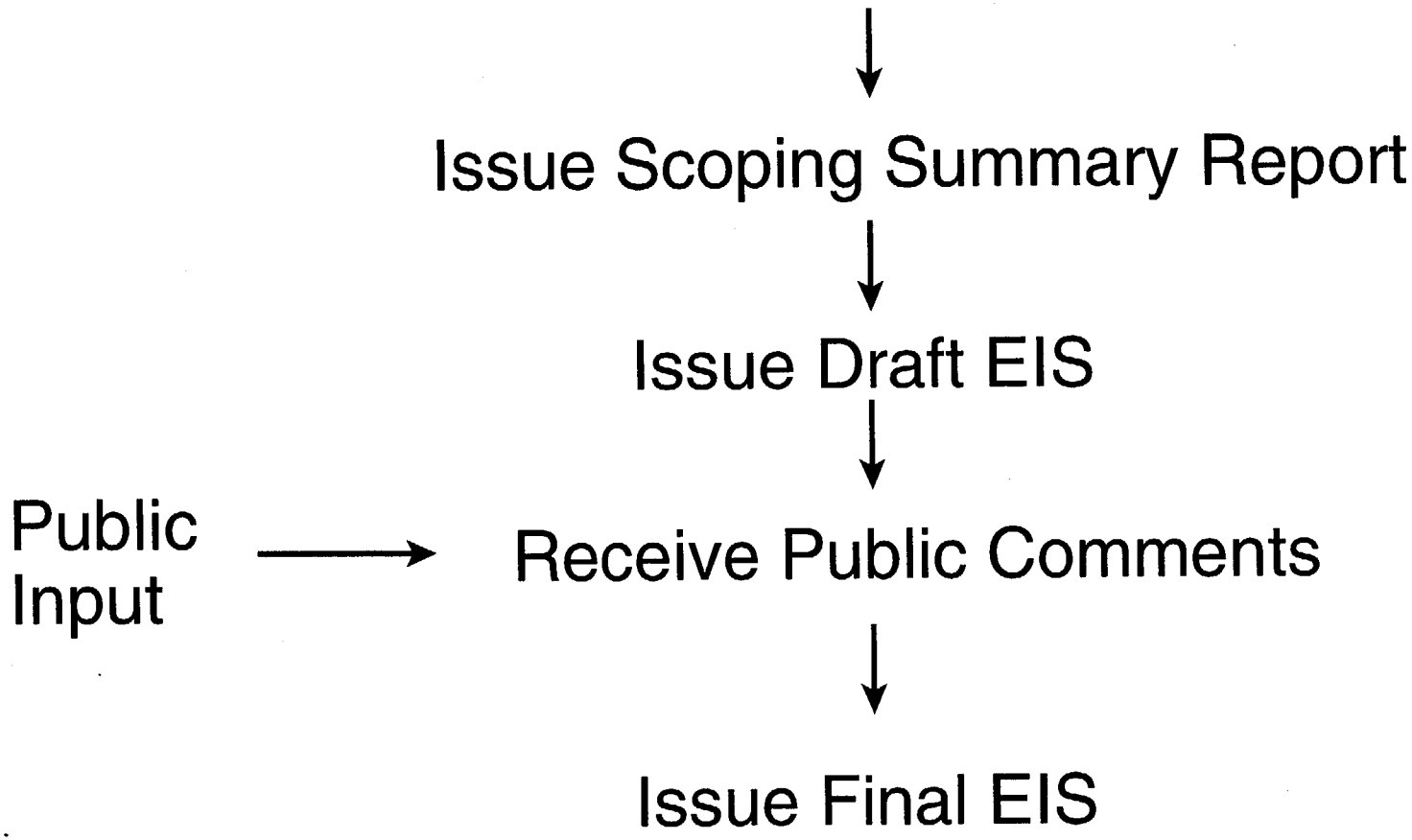

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