

# THE NRC AND MIXED OXIDE FUEL

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ACRS Briefing  
Tim Johnson  
February 2, 2001

# **NRC's ROLE IN MOX**

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

# **AN OVERVIEW OF MIXED OXIDE FUEL AND THE NRC**

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# **A BRIEF HISTORY**

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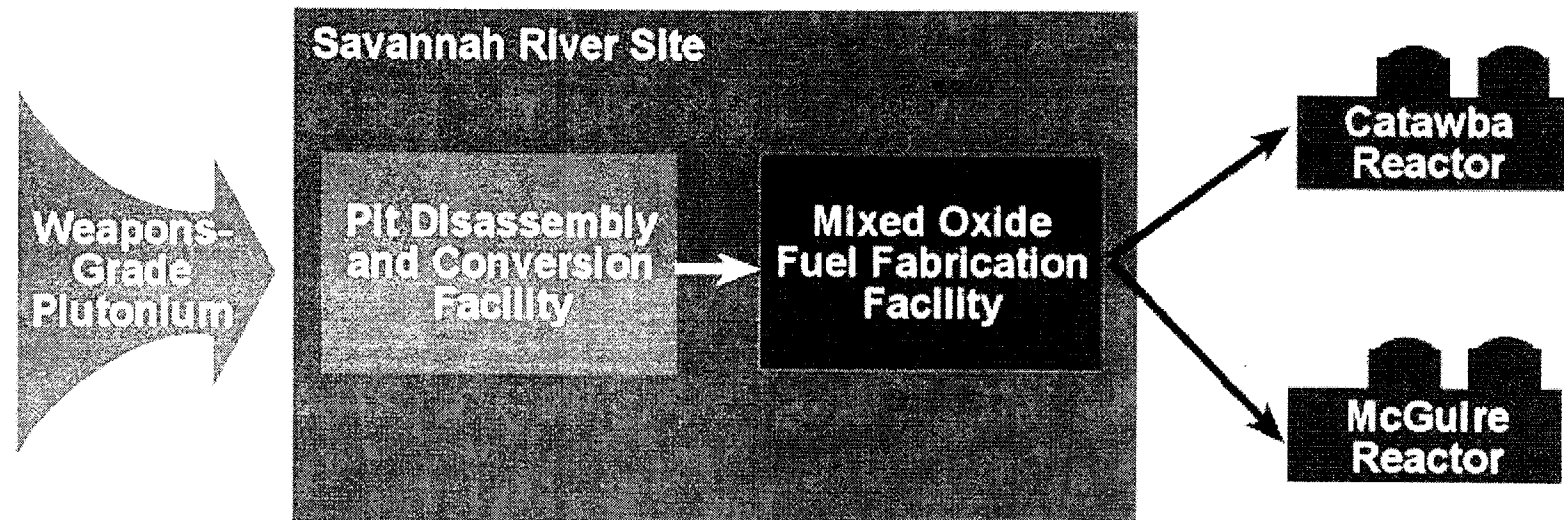
- Agreement with Russia
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- DOE hybrid approach
  - ▶ Convert approximately 25 metric tons plutonium to MOX fuel;
  - ▶ Immobilize approximately 9 metric tons plutonium;
  - ▶ Fabricate the MOX fuel at Savannah River site;
- Contract to license, build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

# NRC Role in Regulating Mixed Oxide Fuel



Yellow = NRC regulated

Blue = DOE regulated

# MOX FUEL FABRICATION PROCESS

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## 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**

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# **AREAS OF NRC REVIEW**

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- Fuel fabrication
- Transportation
- Reactors
- Spent fuel disposal

# ACTIVITIES REQUIRING NRC APPROVAL

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## Fuel Facility

- Two-stage licensing process
  - ▶ Construction
  - ▶ Operation

# CONSTRUCTION

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## 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

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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)**

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# **ENVIRONMENTAL IMPACT STATEMENT (EIS)**

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- Required for major federal actions
- Licensing the fuel fabrication facility pursuant to 10 CFR Part 51

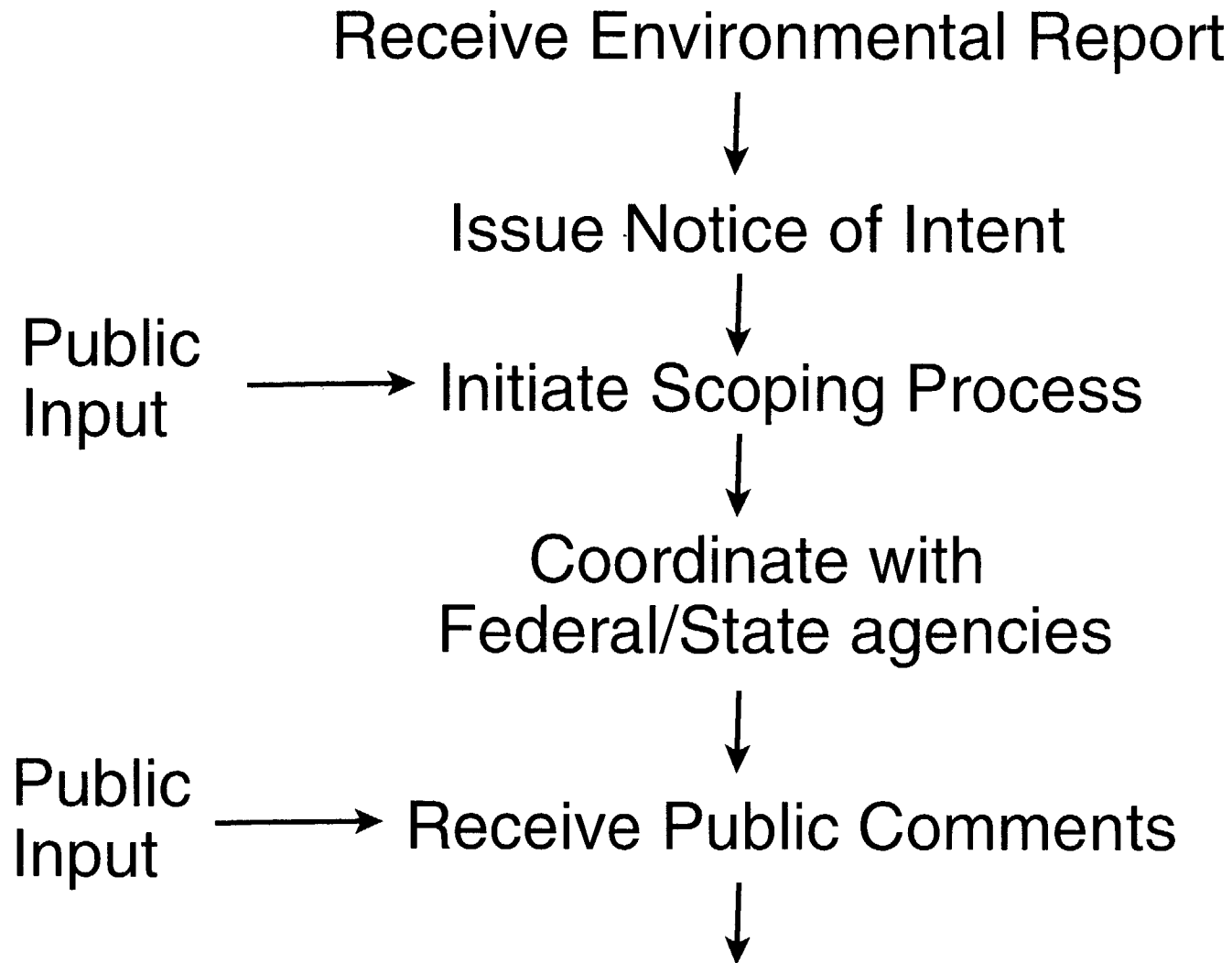
# DOE's EIS

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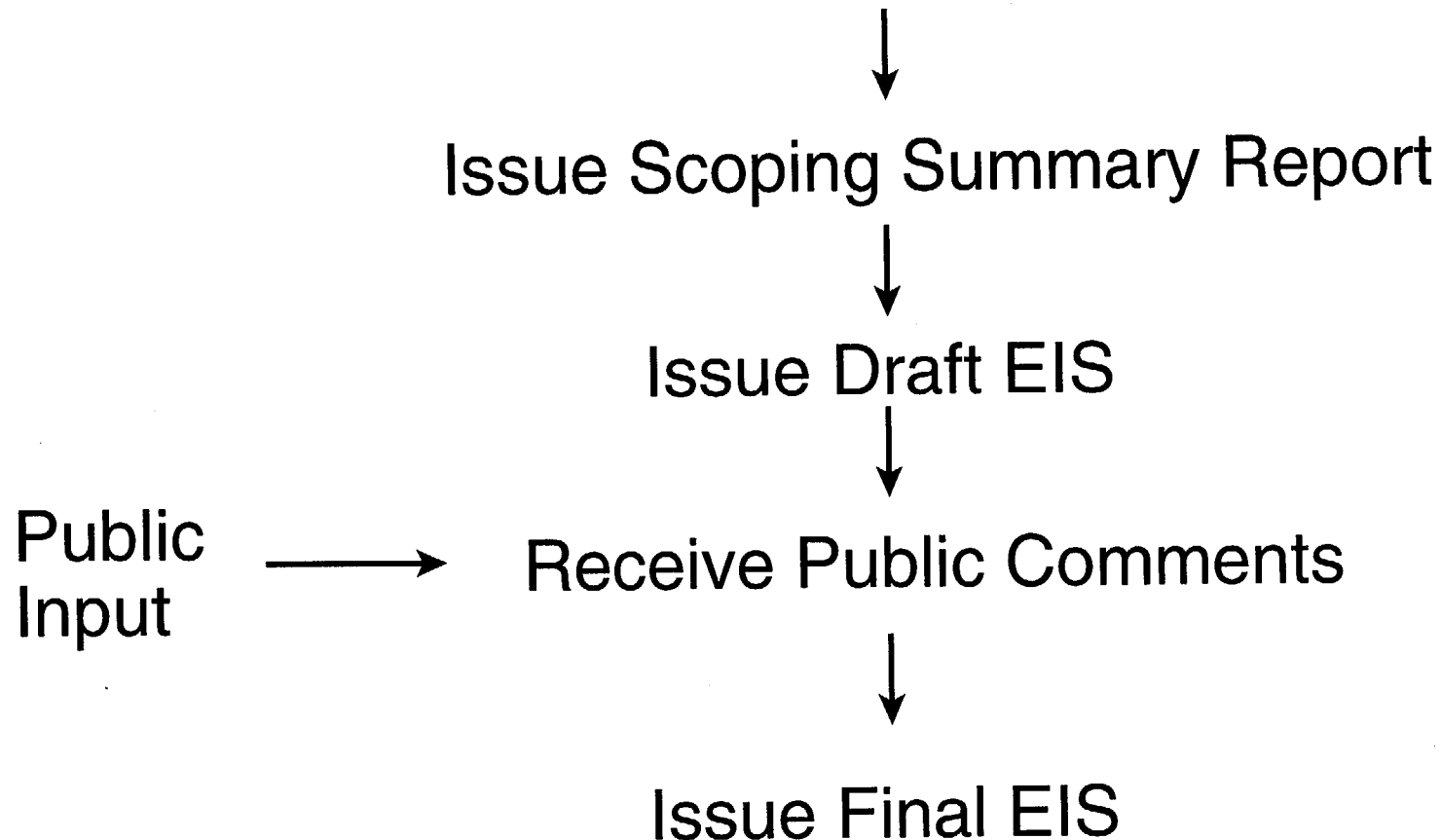
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# THE NEPA PROCESS





# THE NEPA PROCESS



# HEARINGS

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# **PUBLIC HEARINGS**

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- 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

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- 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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# ACTIVITIES TO DATE

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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

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## 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

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## Reactors

- Amendments for use of MOX lead test assemblies (LTAs) expected August 2001
- Irradiation of LTAs at McGuire scheduled to begin October 2003
- License amendment application to use MOX fuel (other than LTAs) in McGuire/Catawba reactors expected January 2004
- MOX fuel irradiation at McGuire/Catawba scheduled September 2007

# **REGULATORY EFFECTIVENESS OF THE ANTICIPATED TRANSIENT WITHOUT SCRAM (ATWS) RULE**

BY  
BILL RAUGHLEY  
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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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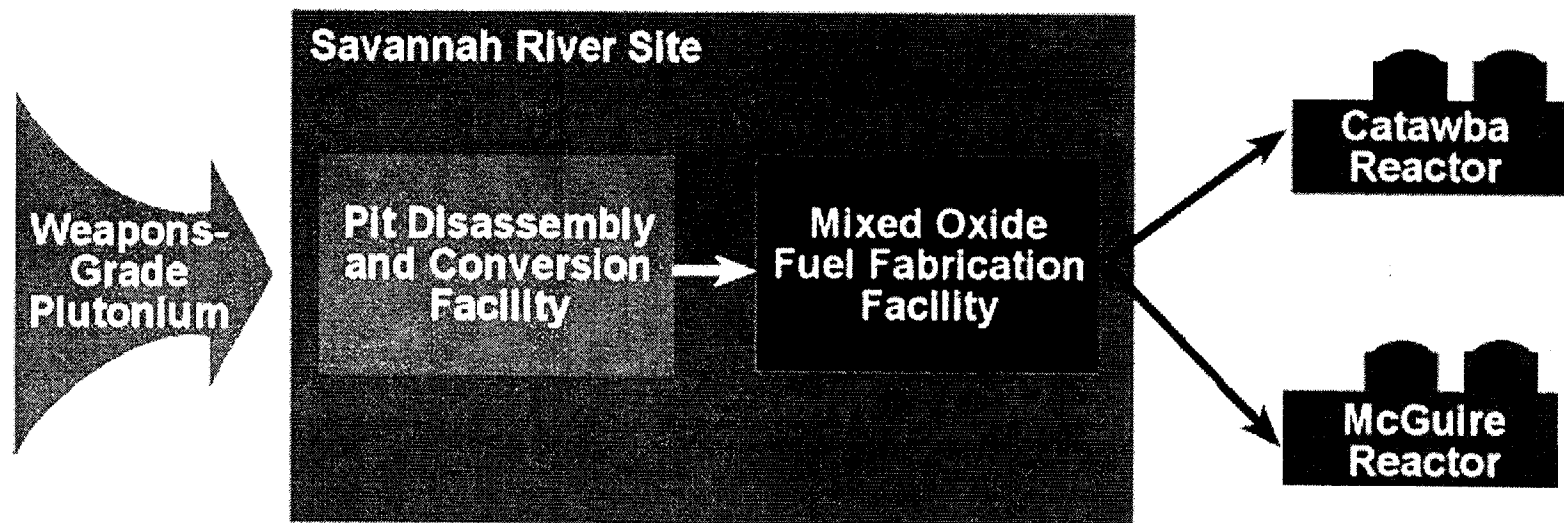
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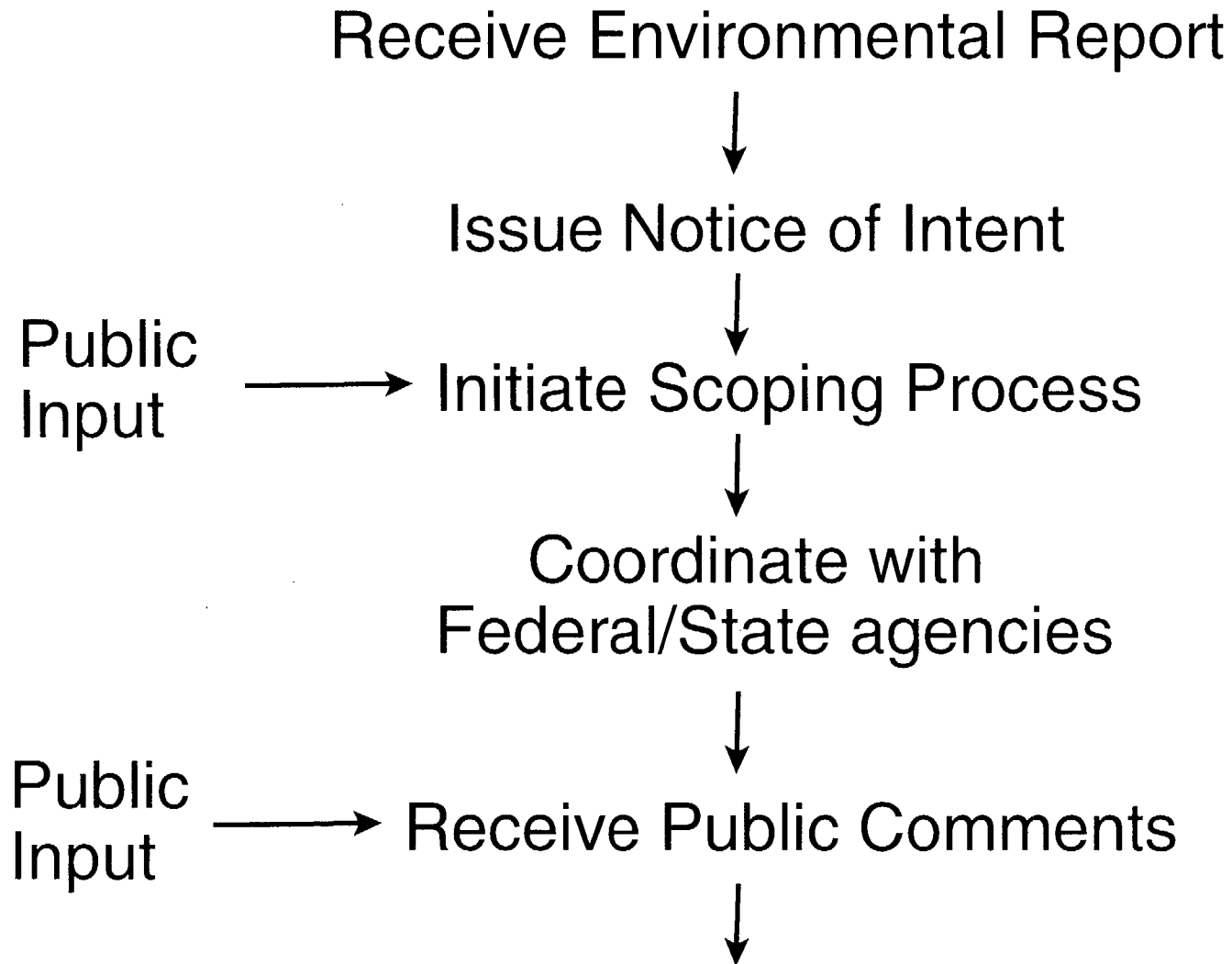
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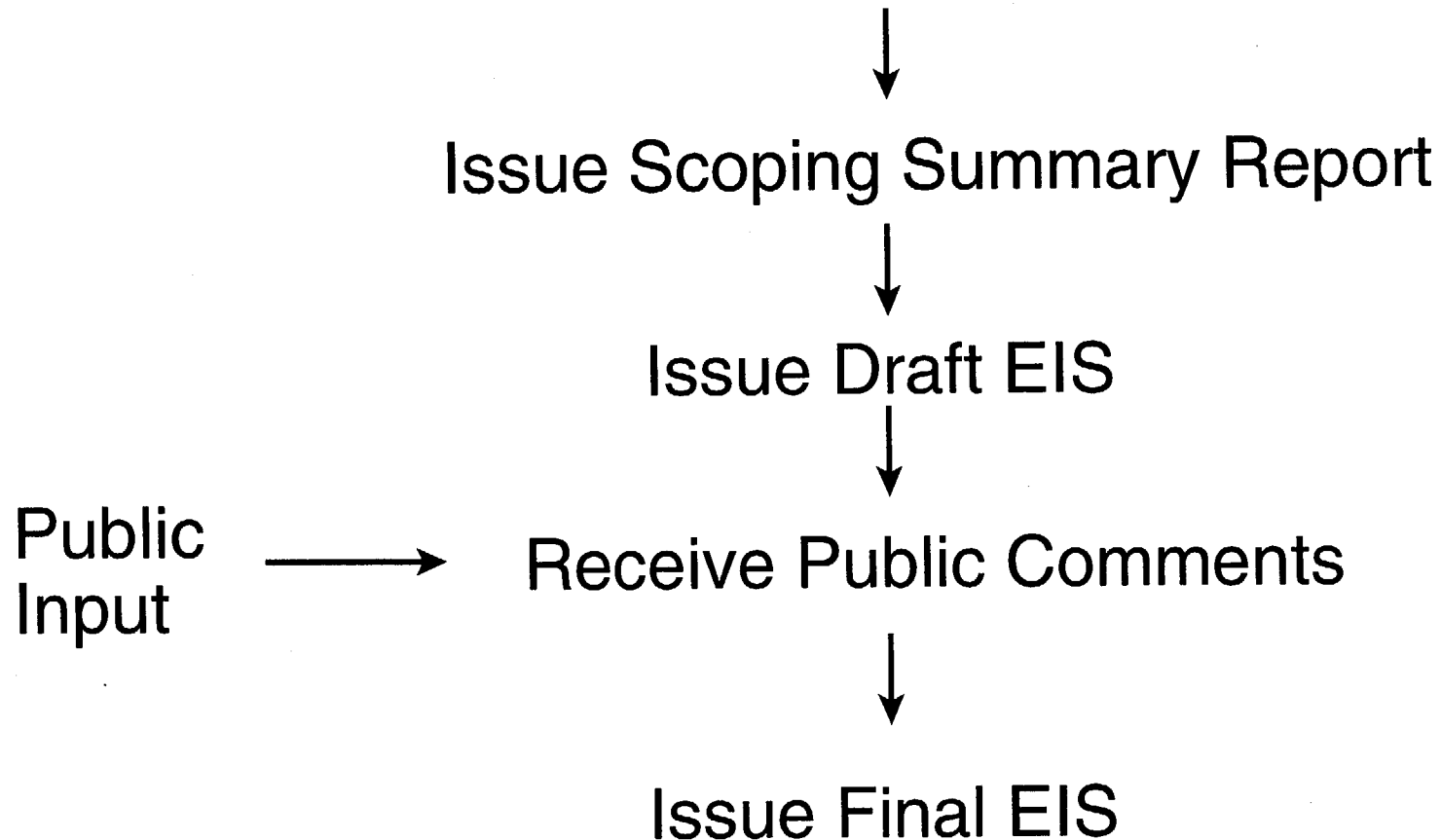
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