AGENDA
HYPERION MEETING WITH NRC
SEPTEMBER 30, 2010

U.S. Nuclear Regulatory Commission
Two White Flint North
11545 Rockville Pike, Room T2B3

TIME	**TOPIC**	**LEAD**
9:00 a.m. – 9:15 a.m.	Opening Remarks and Introductions	NRC / HPG
9:15 a.m. – 9:30 a.m.	Hyperion Corporate Overview	HPG
9:30 a.m. – 10:15 a.m.	Hyperion Product & Technology	HPG
10:45 a.m. – 11:00 a.m.	Pre-Application Planning	HPG
11:00 a.m. – 11:15 a.m.	Break	
11:15 a.m. – 11:45 a.m.	Overall Approach to Licensing	HPG
11:45 a.m. – 12:00 p.m.	Public Questions/Comments	NRC/Public
12:00 p.m.	Adjourn	
12:00 p.m. – 1:00 p.m.	Lunch	
1:00 p.m. – 3:00 p.m.	Closed Meeting	NRC/HPG

Enclosure

Hyperion Power Generation Inc.
2399 Blake Street, Suite 105
Denver, Colorado 80205 U.S.A.
Voice: +1 (505) 216-9130

Web: www.HyperionPowerGeneration.com

Hyperion Power Generation
Information Sharing Meeting with US NRC
Date of Public Meeting: September 30, 2010

Morning Session (Public)

Roster of Hyperion Power Presenters:
Mark S. Campagna, PMP, Chief Operating Officer / Chief Nuclear Officer
Dr. Turner J. (TJ) Trapp, VP Engineering
Pat McClure, Los Alamos National Laboratory Manager
Rich Starostecki, Regulatory Manager

Topic Number	Topic	Pres. Org.	RP HPG Content	Presentation Time (Start/Duration)
1	Introduction & Objectives	HPG	Mark Campagna	0900 / 15mins
2	Introductions of Participants	HPG & NRC	Mark Campagna	0915 / 30mins
3	Hyperion Corporate Overview • Corporate safety approach	HPG	Mark Campagna	0945 / 15mins
4	Hyperion Product & Technology a. Technology History & Status b. Concept & Key Topics • Uranium Nitride Fuel Performance • Lead Bismuth Eutectic Thermal Hydraulic Performance • Sealed Primary System at Near Atmospheric Pressure c. Design Description • Below Ground Containment • Pool Type Concept • Intermediate Loop • 70 MW_{th} / 25 MW_e	HPG	TJ Trapp & Pat McClure	1000 / 45mins
5	Pre-Application Planning Topical report (discuss number & nature & priority) submittals quarterly	HPG & NRC	Rich Starostecki	1045 / 15mins

6	**Overall Approach to Licensing** **a. HPG is responsible & accountable for safety (we will present safety case for licensing); we look forward to independent verification by NRC based on our technical data** **b. Demonstrate equivalency to current NRC GDC** **c. Use of topical reports to convey technical information at early stage; role of peer reviews** **d. Reliance on consensus Codes and Standards** **e. Discuss proposed Analytical Methods** **f. First of a kind plant – demonstration & test reactor instrumented for confirmatory data** **g. Approach to severe accidents consistent with NRC policy** **h. Mechanistic source term under development (explain science & engineering aspects)** **i. Working with ANS/NEI SMR task force Re: licensing process of generic issues** **j. HPM owner's group envisioned**	**HPG**	**Rich Starostecki**	**1100 / 30mins**
7	**Q&A**	**HPG & NRC**	**Mark Campagna, TJ Trapp, & Rich Starostecki**	**1130 / 30mins**

10-10719

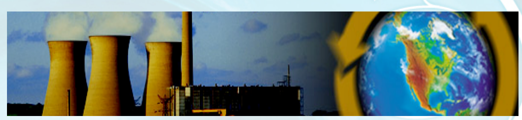
Hyperion Power
GENERATION

U.S. NRC Public Meeting
September 30, 2010
Corporate Overview

Mark Campagna, Chief Nuclear Officer/COO

Hyperion Power

Los Alamos
NATIONAL LABORATORY



- HPG is commercializing small civilian reactor from Los Alamos National Laboratory
  - Technology transfer
  - Exclusive license & CRADA
- Technology Development Support by Los Alamos National Laboratory
  - LANL is a pioneer and leader in civilian nuclear power development
  - Experience in Navy reactors, spacecraft, other small power reactors
  - Expert in neutronics design, reactor safety, security, nonproliferation, economics

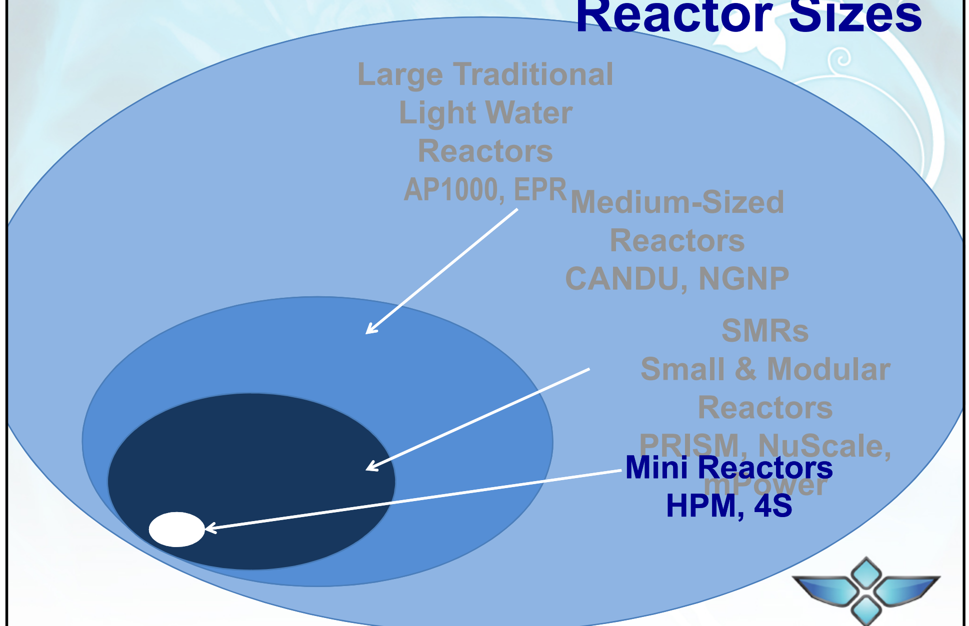
Hyperion Power
GENERATION

Hyperion Power Module Development

- Private Investment through Venture capital & strategic partnerships
- Iterative design process
- Pre-application discussions continue with US and international clients and
  - U.S. NRC
  - U.K. NII
  - Canadian CNSC

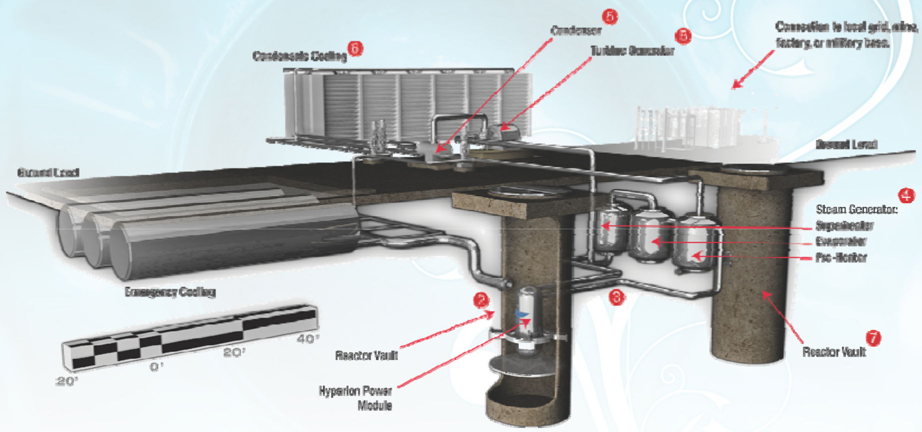
Hyperion Power GENERATION

Reactor Sizes



Hyperion Power GENERATION

Hyperion Power Module Conceptual Plant Configuration



Hyperion Power GENERATION

HPG Objectives

- Hyperion will evolve the HPM design to
  - Demonstrate a high level of safety (e.g., underground containment)
  - Demonstrate security (e.g., sealed vessel, no on-site refueling)
  - Demonstrate safeguards (non-proliferation) goals by burning actinides and generating less Pu than LWRs (wt %)
  - Meet customer requirements
  - Optimize operational life & reliability

Hyperion Power GENERATION

Applications

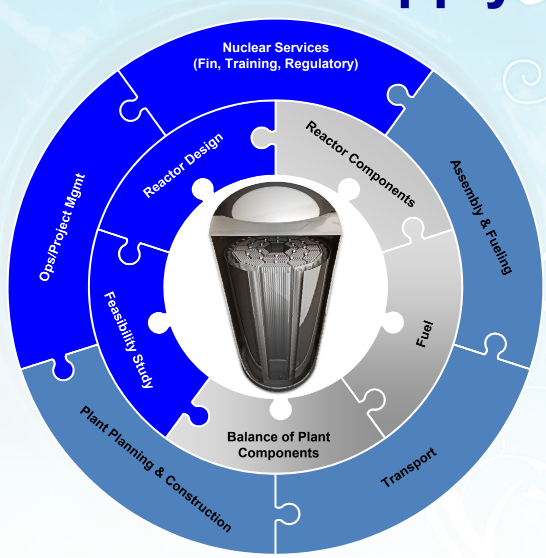
Niche Markets
- Remote off-grid community power
- Dedicated power
  - hospitals, factories, foundries, government centers, water treatment, irrigation, universities
- Baseload for renewable energy
- Remote mining, oil production & refining
- Military facilities

Operations will be subject to the regulatory authority of the host country

HPM Production Phases: 2010-15 Lead Launch; 2015-20 Initial Production; 2020+ Mass Production

Hyperion Power GENERATION

Hyperion Power Supply Chain



Hyperion Power GENERATION

Hyperion Power Generation

U.S. NRC Public Meeting

September 30, 2010

Corporate Safety Philosophy

Mark Campagna, Chief Nuclear Officer/COO

Corporate Safety Philosophy

- Overview
- Description of Safety Concept
- Proliferation Resistance
- Safety and Security (Physical Protection)

Hyperion Power Generation

Nuclear Safety in Design

- Hyperion Safety Policy is woven throughout the company culture
- Using standards based approach
- Always conducting business operations in an open/transparent and high integrity manner

Description of Safety Concept

- HPM -- safe design with minimal nuclear infrastructure at the plant site
- Operating staff
  - Fewer in number
  - Enhanced technical competence
  - Augmented by remote monitoring
- Simplicity of operation, design for reliability
- Reactor vault separate from the power conversion

Proliferation Resistance

- HPM design presently proposed with a sealed core that is opened only at the factory
  - Sealed core provides a barrier to any malevolent activity but also eliminates any need for nuclear infrastructure at the operational site or even within the operating nation
- Concentrating nuclear infrastructure in a few select locations on earth not only frustrates non-state terrorist groups but even rogue nations

Hyperion Power GENERATION

Proliferation Resistance

- Conservative design criteria include
  - Operations / Maintenance
  - Storage
  - Transport
- Factors consistent with IAEA objectives

Hyperion Power GENERATION

Safety and Security (Physical Protection)

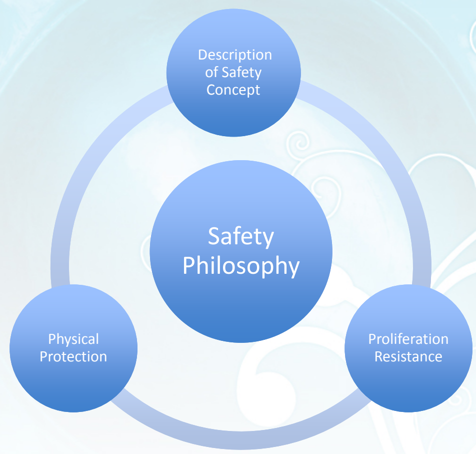
- Safety principles the HPM will adhere to include:
  - Reliance on natural circulation for postulated events
  - Using highly reliable passive safety features to drive down the probability of failure
  - Reduce the frequency and consequence of accidents that could impact public safety
  - Use multiple barriers to prevent release of radioactive materials
  - Use of multiple barriers for physical security

Safety and Security (Physical Protection)

The HPM will be designed to eliminate or reduce the likelihood of accidents during transportation

- Designing to reduce the potential for criticality accidents
- Elimination of any interaction of the reactor coolant with water (by choice of lead bismuth eutectic as a reactor coolant)
- Protection from fire and a highly reliable means of cooling on transport back to the factory

Summary



Hyperion Power Generation

Hyperion Power Generation

U.S. NRC Public Meeting

September 30, 2010

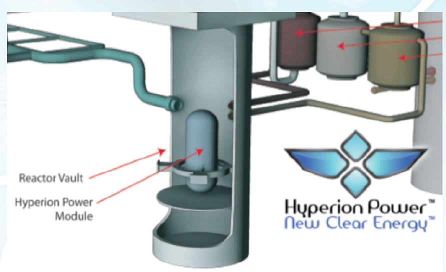
DESIGN DESCRIPTION AND SAFETY APPROACH

TJ Trapp, VP Engineering
Pat McClure, Los Alamos National Laboratory, Project Lead

Hyperion Power Module Objective

2

- To design, develop, manufacture, install, and service small nuclear power units in the range of 20 to 50 MWe in multiple market segments worldwide



Hyperion Power Generation

September 30, 2010

Hyperion Power Module Parameters

3

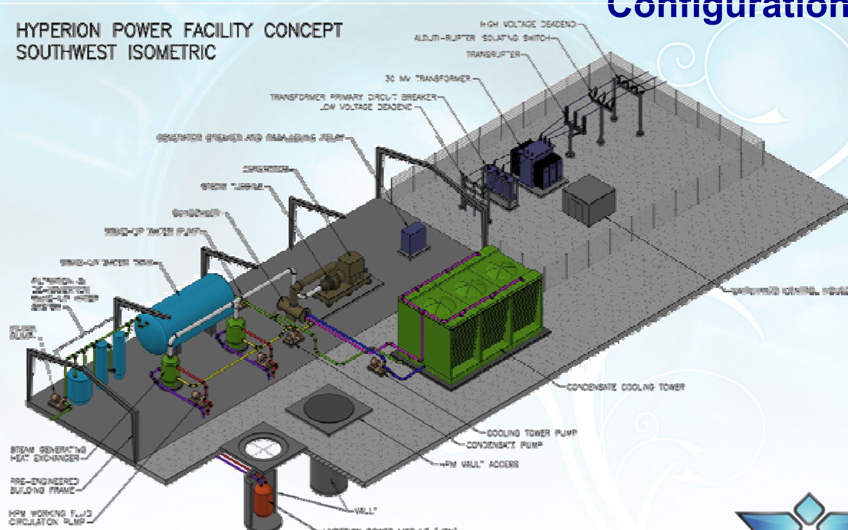
Reactor Power	70MW $_{thermal}$
Electrical Output	25MW $_{electric}$
Lifetime	7 – 10 years
Size (meters)	1.5w x 2.5h
Weight (tonnes)	Less than 50 (Incl. vessel, fuel and primary coolant LBE)
Structural Material	HT-9 or T-91
Coolant	LBE (45% Pb, 55% Bi wt%)
Fuel	HT-9 or T-91 clad, uranium nitride
Enrichment (% U-235)	<20%
Refuel on Site	No
Sealed Core	Yes
Passive Shutdown	Yes
Active Shutdown	Yes
Transportable	Yes – intact core
Factory Fueled	Yes
Safety & Control Elements	Two redundant shutdown systems

Hyperion Power GENERATION

September 30, 2010

Hyperion Power Module Conceptual Electric Generation Plant Configuration

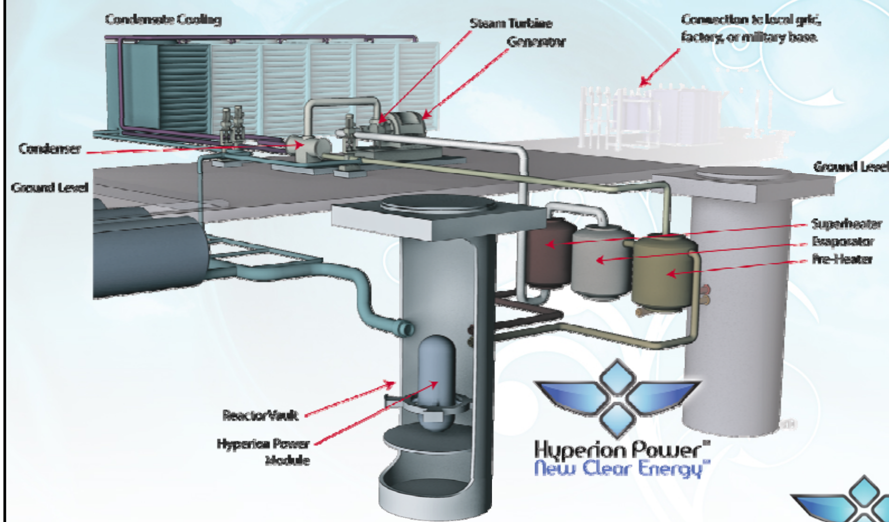
4



Hyperion Power GENERATION

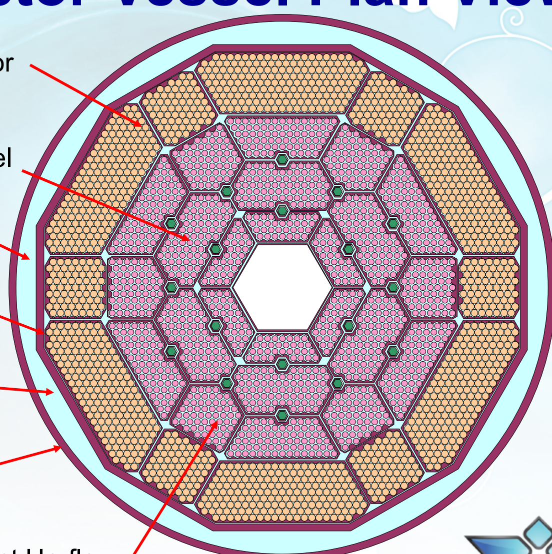
September 30, 2010

NSSS Conceptual Layout



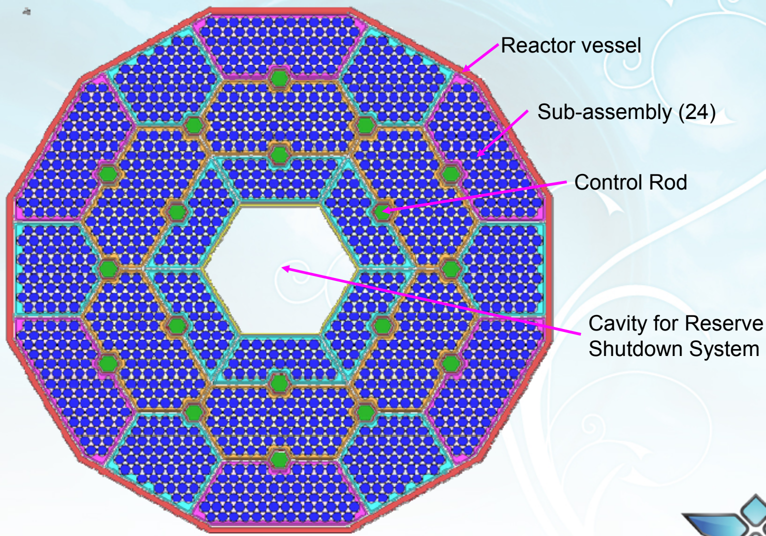
Hyperion Power
GENERATION

Reactor Vessel Plan View



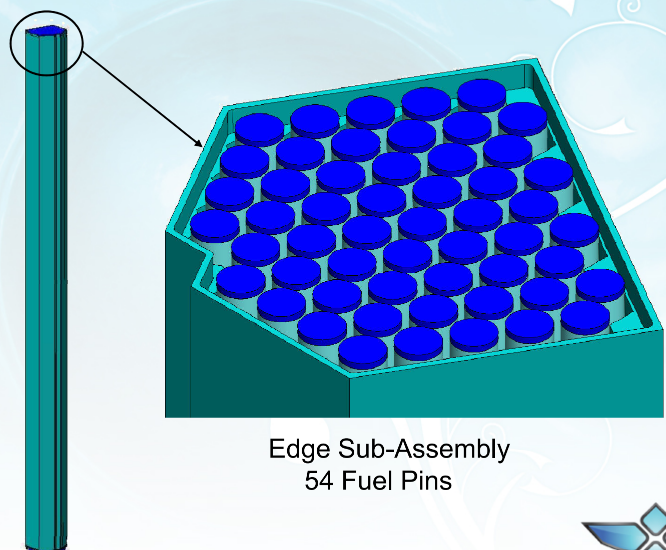
Hyperion Power
GENERATION

Plan View of Active Core



Hyperion Power Generation

Core Sub-Assembly

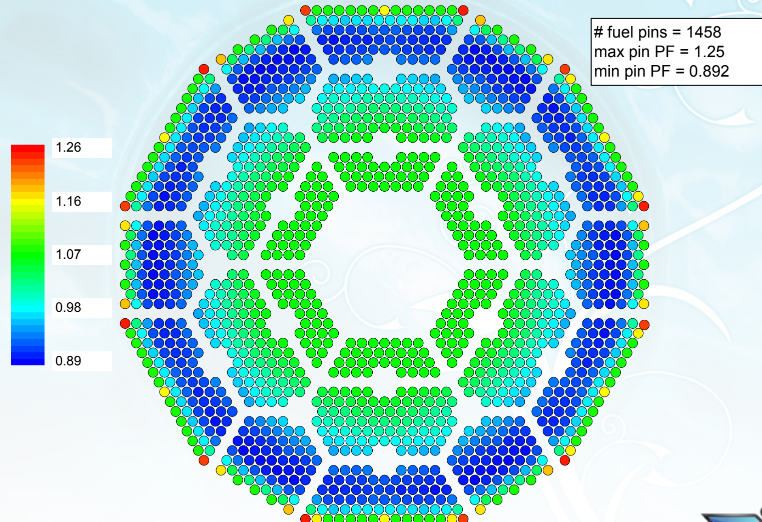


Edge Sub-Assembly
54 Fuel Pins

Hyperion Power Generation

9

Power Distribution



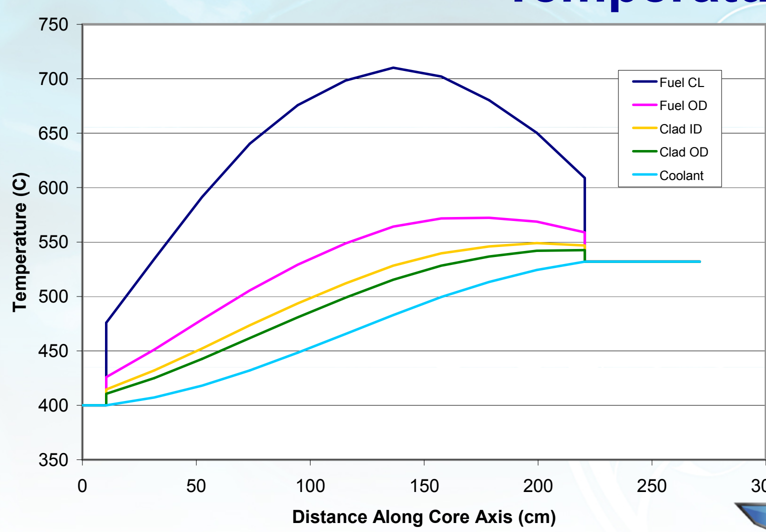
Fuel Pin Peaking Factors at BOL

September 30, 2010

Hyperion Power Generation

10

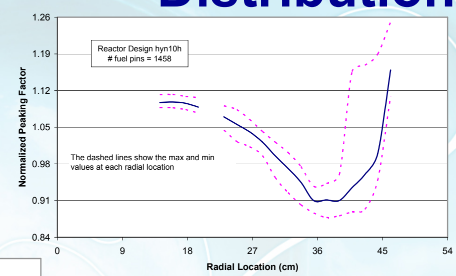
Peak Power Fuel Pin BOL Temperatures

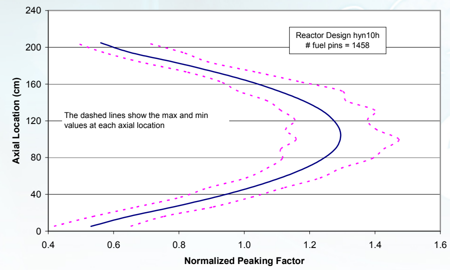


September 30, 2010

Hyperion Power Generation

Time-Average Core Power Distribution





Hyperion Power Generation

Criticality Calculations

k-eff	configuration (beginning-of-life)
1.081	cold, reserve-shutdown and control out
0.871	cold, reserve-shutdown and control in
0.954	cold reserve-shutdown in and control out
0.956	cold reserve-shutdown out and control in
1.069	warm all out
1.058	warm all out, core coolant voided
0.995	warm all out, all reactor coolant voided (plena, downcomer)

Hyperion Power Generation

Design Features Being Considered

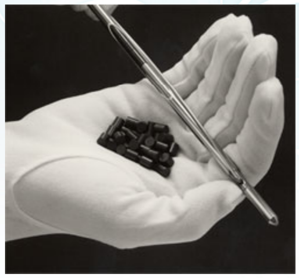
- Use of intermediate loop with LBE
  - Eliminates steam generator tube rupture issues in primary system
    - No positive reactivity voids for this design
    - No pressure wave
- HPG is examining heat exchanger and pump configurations
  - Internal heat exchanger and pump(s) similar to a pool type reactor
  - External heat exchanger and pump(s) similar to a loop type reactor

UN Fuel

- Uranium Nitride (UN) is a ceramic fuel that has superior thermal and neutronic properties compared to UO_2
- Desirable properties of UN compared to UO_2 include:
  - Higher melting temperature (2888 vs. 2749^{o}C),
  - Higher thermal conductivity (26 vs. 2 W/m-K),
  - Higher uranium density (13.52 vs. 10.5 g/cc),
  - Low fission gas release,
  - Low fuel swelling, and
  - Greater resistance to irradiation damage over extended periods of time (~ 10 years)

UN Fuel Data

- US
  - Fuel testing under the space reactor program, LMFBR, and SP-100.
  - 90 pins irradiated in FTR at FFTF and EBR-II
- Russia
  - BR-10 research reactor fuel. Large number of fuel pins irradiated.
  - LBE and Pb coolant data and advanced cladding materials.
- Japan
  - '94 irradiation testing of mixed nitride fuel.
  - Part of their fast reactor program.
- France
  - '99 tests with He bonded mixed nitride fuel.



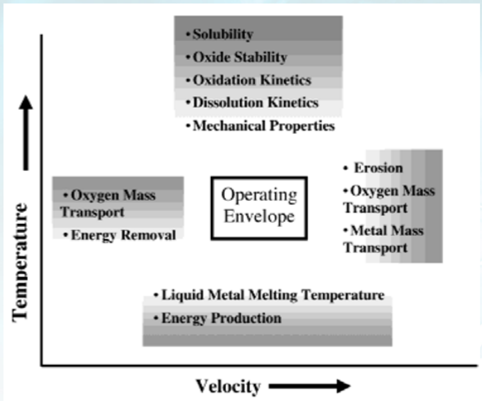
Hyperion Power Generation

Coolant Selection Considerations

- LBE was selected as the coolant:
  - No chemical reactivity with water and air
  - Much higher boiling temperature than Na (883^{o} C for Na vs. 1670^{o} C for PbBi)
  - Virtually no expansion of LBE on melting
  - LBE has a strong negative void coefficient
- Issues associated with LBE coolant are:
  - Compatibility with structural materials (corrosion) including coolant chemistry control
  - Bismuth irradiation and Polonium generation

Hyperion Power Generation

Coolant-Lead Bismuth Eutectic



Balinger, et al. Nuclear Technology 147, 418, 2004

- Oxygen concentration: ~0.02-0.05 ppm
- Flow Velocity: <2 m/s for 500^{o}C, <5 m/s for 400^{o}C
- Corrosion rate: ~0.01mm/yr @ 500^{o}C for HT-9
- Oxygen control: Solid phase oxygen control system

Hyperion Power Generation

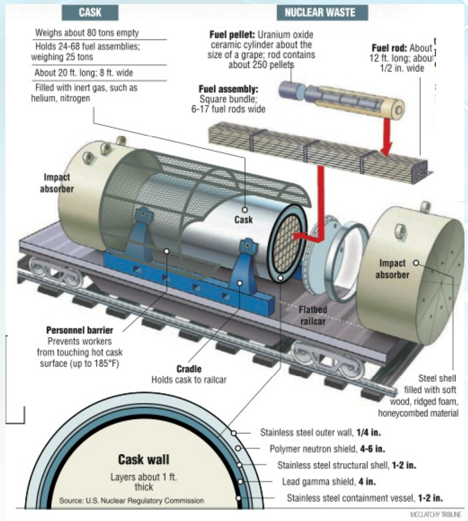
HT-9 & T-91 Candidate Cladding and Structural Materials

- HT-9 is the widely accepted material for use in fast reactors in U.S. It has a high ductility in high fluence environments. Currently, it has a broad database.
- T-91 has higher temperature strength and higher radiation resistance than HT-9, and also higher swelling. Current T-91 has an ASME code, and also a broad database.
- There are more experimental data for T-91 in LBE than for HT-9. The protective layers for the two steels are similar. Based on a current model analysis, the corrosion for T-91 is about 2 times higher than for HT-9.

Hyperion Power Generation

NRC Licensed Shipping Cask

- Vessel and core designed for transport in licensed cask envelope
- Working with cask designer on differences in:
  - Weight
  - Volume
  - Decay Heat
  - Crit Safety

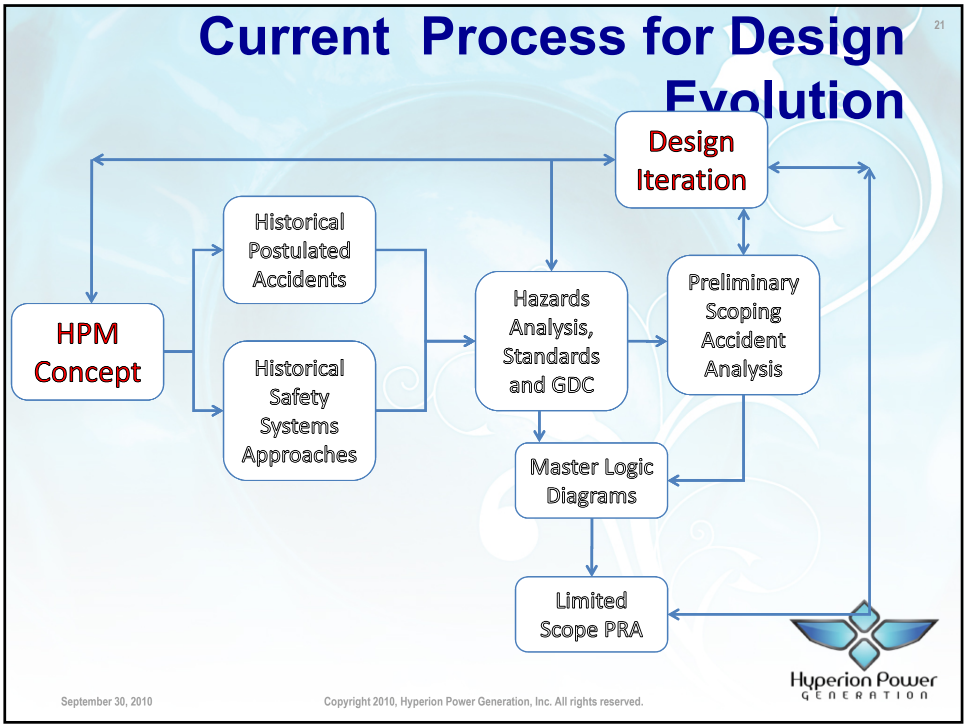


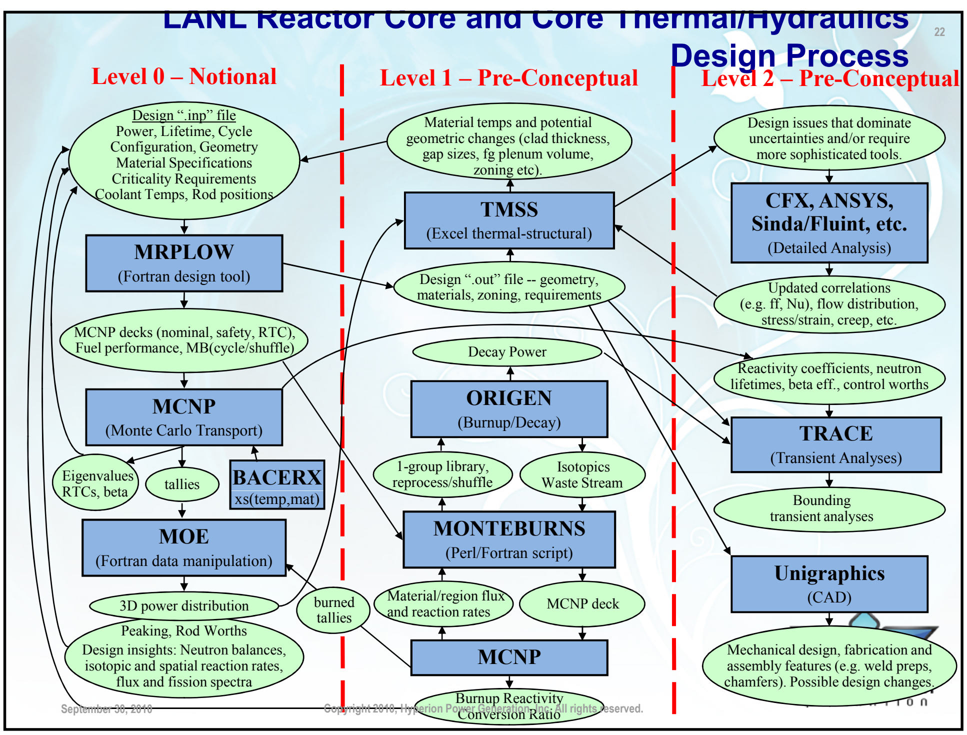
Hyperion Power GENERATION

Design Outline

- Process for Design Evolution
- Examples of types of calculations that support design and safety
  - Rod Ejection
  - Loss of Flow

Hyperion Power GENERATION


Current Process for Design Evolution
21
Design Iteration
Historical Postulated Accidents
HPM Concept
Historical Safety Systems Approaches
Hazards Analysis, Standards and GDC
Preliminary Scoping Accident Analysis
Master Logic Diagrams
Limited Scope PRA
Hyperion Power GENERATION
September 30, 2010
Copyright 2010, Hyperion Power Generation, Inc. All rights reserved.


LANL Reactor Core and Core Thermal/Hydraulics Design Process
22
Level 0 – Notional
Level 1 – Pre-Conceptual
Level 2 – Pre-Conceptual
Design ".inp" file
Power, Lifetime, Cycle
Configuration, Geometry
Material Specifications
Criticality Requirements
Coolant Temps, Rod positions
MRPLOW
(Fortran design tool)
MCNP decks (nominal, safety, RTC), Fuel performance, MB(cycle/shuffle)
MCNP
(Monte Carlo Transport)
Eigenvalues RTCs, beta
tallies
BACERX
xs(temp,mat)
MOE
(Fortran data manipulation)
3D power distribution
burned tallies
Peaking, Rod Worths
Design insights: Neutron balances, isotopic and spatial reaction rates, flux and fission spectra
Material temps and potential geometric changes (clad thickness, gap sizes, fg plenum volume, zoning etc).
TMSS
(Excel thermal-structural)
Design ".out" file -- geometry, materials, zoning, requirements
Decay Power
ORIGEN
(Burnup/Decay)
1-group library, reprocess/shuffle
Isotopics Waste Stream
MONTEBURNS
(Perl/Fortran script)
Material/region flux and reaction rates
MCNP deck
MCNP
Burnup Reactivity Conversion Ratio
Design issues that dominate uncertainties and/or require more sophisticated tools.
CFX, ANSYS, Sinda/Fluint, etc.
(Detailed Analysis)
Updated correlations (e.g. ff, Nu), flow distribution, stress/strain, creep, etc.
Reactivity coefficients, neutron lifetimes, beta eff., control worths
TRACE
(Transient Analyses)
Bounding transient analyses
Unigraphics
(CAD)
Mechanical design, fabrication and assembly features (e.g. weld preps, chamfers). Possible design changes.

MCNP

- Capable of modeling radiation transport phenomenon for all parts of the fuel cycle
  - Criticality, fixed source, burnup, prompt and delayed particle
- Extends MCNP4C to virtually all particles and energies
  - Prompt and delayed particle transport
- Uses infinite dilute continuous energy cross sections and combinatorial geometry
- Creates and tracks most complex sources and tallies
  - Interdependent source variables, 7 tally types, many modifiers, tally tagging
- Supported on virtually all computer platforms
  - Unix, Linux, Windows, OS X (parallel with MPI)

Reactivity Accident Considerations

- Rod Ejection – Design criteria to keep worst case single rod worth below $1 in reactivity.
  - For reference design
    - Worst case rod = 0.0058 dk
    - Beta-effective = 0.0073 dk
- Coolant Voiding – LBE has very low neutron absorption (considerably lower than Na) and is a good neutron reflector.
  - For reference design, the coolant worth is substantial.
    - Bulk worth of coolant in the fueled region at BOL = .011 dk
    - Bulk worth of all coolant within the reactor vessel at BOL = .074 dk
  - All calculations thus far have found a negative void coefficient in all regions and operating regimes (more needed to verify there are no localized affects).

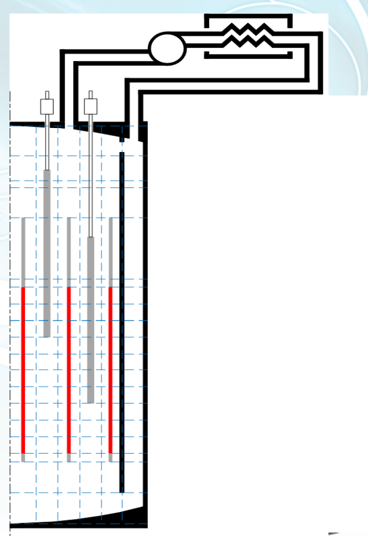
TRAC/TRACE

- **Using TRAC/TRACE to perform thermal-hydraulic calculations to support design and consider accident conditions**
- **TRAC/TRACE – LANL added Lead-Bismuth Eutectic properties in the 1990's to support the development of accelerator targets for the transmutation of waste.**

Hyperion Power GENERATION

HPM TRACE Scoping Models

- **Scoping models - Several configurations**
  - **Pump and heat exchanger internal to vessel**
  - **Pump and heat exchanger external to vessel**
  - **Other variations**
- **Nodalization - 5-ring core**
- **PbBi Eutectic in vessel and loops**
- **Pool surrounding vessel with water at atmospheric pressure for decay heat removal.**



Hyperion Power GENERATION

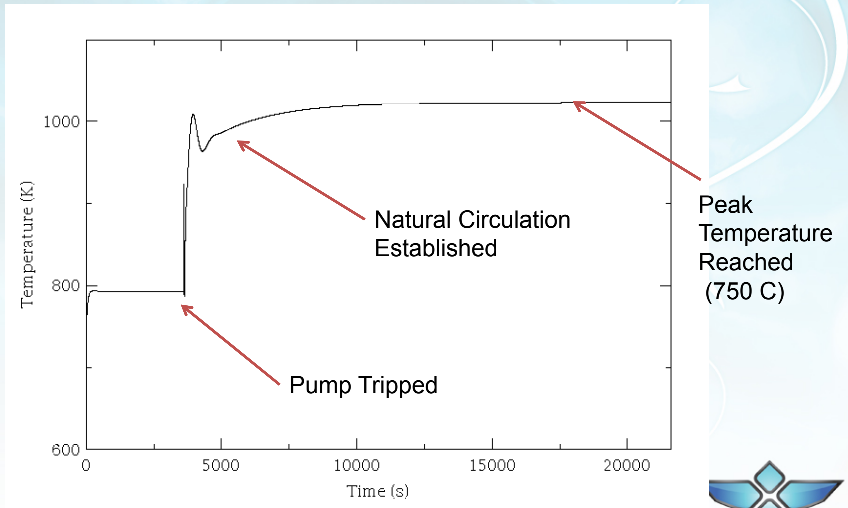
Steady-State Operating Conditions for TRACE Scoping Model

- Thermal power of 70 MW
- Core flow rate of 4,893 kg/s
- Average coolant temperature of 450 C
- Capacity to manage coolant swelling
- All temperatures initialized at 450 C
- HX heat removal rate set equal to 70 MW

Example Calculations

- Loss of Flow Accident
  - Reactor scrammed, Pumps stopped
  - Heat exchangers operating
  - Core cooling via natural circulation
  - Results
    - Good natural circulation (>8 cm/s core velocity)
    - Maximum cladding temperature ~ 750^{O} C (1020^{O} K)
- Loss of Coolant Accident
  - Reactor scrammed, Pumps stopped
  - Heat exchanger failed given break in piping
  - Core cooling via natural circulation
  - Results
    - Good natural circulation established
    - Peak make-up water requirements to remove decay heat ~17 gpm

Loss of Flow – Peak Clad Temperature



Hyperion Power GENERATION

Summary

- **Hyperion will evolve the HPM design to**
  - **Demonstrate a high level of safety (e.g., underground containment)**
  - **Demonstrate security (e.g., sealed vessel, no on-site refueling)**
  - **Demonstrate safeguards (non-proliferation) goals by burning TRU and generating comparable Pu to LWRs (wt %) w/ higher burnup**
  - **Meet customer requirements**
  - **Optimize operational life & reliability**

Hyperion Power GENERATION

U.S. NRC Public Meeting
September 30, 2010

Pre-Application Planning & Licensing Approach

Rich Starostecki, Regulatory Manager

2

Pre-Application Planning

- Responsibility & Accountability for Safety
  - Hyperion takes ownership
  - Obligation to provide NRC with information/data
  - Focus on assuring a better understanding of technology in a transparent and thorough manner

September 30, 2010

Pre-Application Planning

- SRS Energy Park
  - Role for demonstration SMR
- SRS Site
  - Administration goal - Carbon free by 2020
  - HPM power provider for site (not grid)
- Technology
  - Assure DOE & NRC Access

Hyperion Power Generation

Pre-Application Planning

- Role of Topical Reports
  - Address unique features of technology
  - Prioritization of critical design and safety issues
  - Establish early interaction with NRC on Topics
  - Technical Bases Established
  - Standards Based Approach

Hyperion Power Generation

5

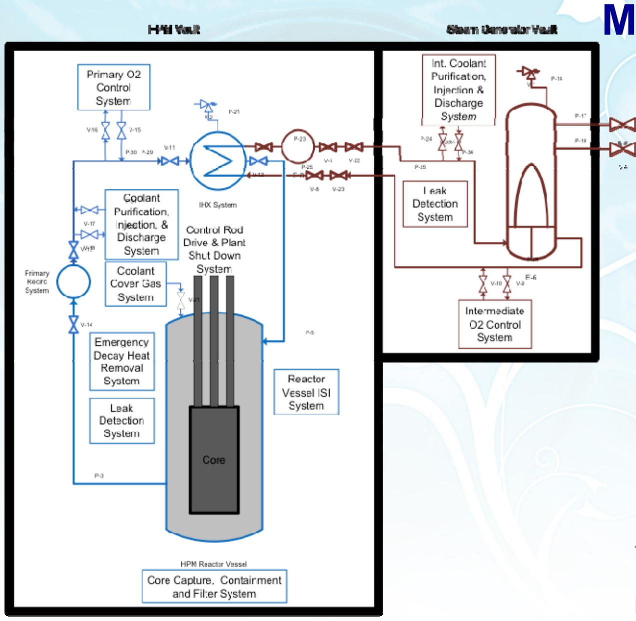
Pre-Application Planning

- Topical Report Preparation & Review Process
  - Abstracts
  - Internal and External (SME) Peer Review
  - Periodic Submittals to NRC
  - Independent Reviews by NRC in support of licensing
  - Allowance for Questions and Discussions

Hyperion Power GENERATION

6

Simplified Diagram of Hyperion Power Module



Hyperion Power GENERATION

HPM Topical Reports: Sequence 1

7

HPM Materials	Fuel cladding, the reactor vessel materials, including support structures, their performance over the design life time of the reactor, including expected transients and accident conditions, and must include discussion on erosion, corrosion, embrittlement, surface coatings, etc.
UN Fuel Performance	UN fuel performance (including swelling, void formation, fission gas release and maximum burnup) with and without clad defects and failures.
Reactivity Control and Emergency Reactor Shutdown	Normal and emergency reactor plant reactivity control systems and methods.

Hyperion Power GENERATION

September 30, 2010

HPM Topical Reports: Sequence 1

8

LBE Corrosion Control	LBE corrosion issues and concerns and the systems and methods used to minimize and/or prevent LBE corrosion.
Coolant Chemsitry Control	Purification loop - how is polonium controlled, including polonium generation in coolant and cover gas regions, removal and control mechanisms required to maintain acceptable LBE coolant purity and what are plant limitations due to radiotoxicity, oxygen and corrosion.
Alternative Source Term	Derivation of alternative source term for HPM reactor, assuming partial core failure and release of fission products into LBE coolant.

Hyperion Power GENERATION

September 30, 2010

HPM Topical Reports: Sequence 2

9

Core Neutronics	Neutronics, including neutron spectra in various regions of the core and surrounding areas as effected by transient conditions during or resulting from postulated accidents.
LBE	LBE thermal hydraulic performance under startup, transients and accident conditions – include systems (primary, intermediate and SG systems) response to transients via TRAC code.
Fission Product Management and Control	Fission product management requirements internal to the fuel pins.
Severe Accidents	Severe Accident performance relative to NRC's severe accident policy •Containment (including robustness, design pressure, etc.) •Inherent retention capability •PRA (including HCDA, core melt, other SA scenarios) •Toxic Chemical Releases •Severe Accident Strategy •Hypothetical Core Disruptive Accidents (HCDAs) •Steam Explosions •Containment Design Pressure •Core Retention Device •HVAC
Emergency and Shutdown Decay Heat Removal	Systems and methods used to remove decay heat during emergency situations, and following normal reactor shut down.

Hyperion Power Generation

September 30, 2010

HPM Topical Reports: Sequence 2

10

Electro-Magnetic (or Mechanical) Pumps	Technology used to provide for both primary and intermediate LBE fluid movement (or pumping capacity) and the associated limitiations.
LBE Leak Detection	Systems and methods used to detect LBE leaks, and the methods and/or systems used to minimize adverse consequences from these leaks. This must also include some discussion on plant operations in the event that LBE leaks are discovered.
Intermediate Heat Exchange and Steam Generator	Materials, thermal-hydraulics, interfaces, pressures, etc. for the IHX and S/G.
In Service Inspections (ISI) and Remote Monitoring and Diagnostics	Method in which ISI and remote monitoring and diagnostics will be implemented in the design.
Accident Analyses	Address risk informed approach to be used for design.

Hyperion Power Generation

September 30, 2010

HPM Topical Reports: Sequence 3

Integrated Plant Operations	Normal operations, and shut down.
Physical and Cyber Security	Reactor start-up, normal operations, and shut down, consistent with NRC guidelines.
Aircraft Impact	Evaluation of aircraft impact on the HPM power plant, consistent with NRC guidelines.
Seismic	Evaluation of seismic event on HPM power plant, consistent with NRC guidelines.
Requirements Management	May be combined with HFE.
Human Factors Engineering	Cover the requirements of NUREG 0711.
Quality Assurance	This is a unique chapter (17) in DCD space.

HPM Topical Reports: Sequence 3

HPM Transportation Strategies and Methodologies	Methods and strategies used to transport the HPM and associated radiological and/or biohazard systems or sub-systems to and from operational sites.
GDC	Establish equivalency with Appendix A criteria.
DCIS	Instrumentation & Control considerations (including automatic response and reliance on digital systems) for the design basis of an LBE fast reactor plant. It must also include details on the schemas or methodologies used to implement digital instrumentation and controls and ensure verification and validation requirements can be met. Additionally, cyber security, hardware and software diversity and defense in depth in depth methodologies must be defined for safety and/or non-safety related DCIS.

Approach to Licensing

- Hyperion Accountable for Safety
  - Looking forward to Independent NRC Review & Validation
  - Periodic dialogue to assure information flow
- Equivalency to GDC of Appendix A
  - Report to be submitted

Hyperion Power GENERATION

Approach to Licensing

- Preliminary Design and Final Design Considerations for Licensing
  - Two step review process for test & demonstration (construction & operation)
  - Manufacturing License for final design
  - Technology information to remain valid with supplemental data derived from testing

Hyperion Power GENERATION

Approach to Licensing

- Defense in Depth Design Approach
  - Reliable design based on proven standards
  - Designed to accommodate effects of broad spectrum of design basis accidents; diverse shutdown systems; & DHR system
  - Pressure & leak resistant containment below grade
  - Emergency Planning

Hyperion Power GENERATION

Approach to Licensing

- U.S. & International Standards Based Approach
  - Interactions with foreign researchers
  - LBE used as coolant
- Test & Demonstration for first plant
  - Instrumented to collect data

Hyperion Power GENERATION

Approach to Licensing

- Commission's Safety Goal & Severe Accident Policies will be included
- Working with industry on technology-neutral issues affecting licensing
  - Security
  - Staffing
  - Fees & Liability Coverage
- Operating Experience feedback
  - HPM Owners' Group envisioned
  - OE feedback from industry for design

Hyperion Power GENERATION

Approach to Licensing

- Source Term
  - Alternative source term under development
  - Consistent with NRC guidance & specific to UN Fuel and LBE coolant
  - Substantial core failure assumed due to hypothetical flow channel blockages
  - Demonstrate bounding of credible severe accident scenarios

Hyperion Power GENERATION

Approach to Licensing

- Source Term (continued)
  - LBE provides unique fission & activation product retention capability & shielding
  - Chemical forms & Volatility of fission products and activation products to be accounted for in a LBE system

Hyperion Power Generation