TERRESTRIAL ENERGY USA

Merits of a Liquid Fuel Reactor System

"Restoring America's Nuclear Competitive Edge with the Cost Competitive and Highly Reliable IMSR® 400"

13 June 2017

- Private and Confidential -

HY DO NUCLEAR TECHNOLOGY CHOICES MATTER?
UNDAMENTAL RELATIONSHIP

APEX = f (reactor system's Safety Case)

fety Case drives:

- Cost and risks to develop
- Cost and risks in licensing
- Cost and risks to construct

Control

Cool

Contain

A reactor's Safety Case is technology specific
Technology choices impact CAPEX strongly

Technology choices drive CAPEX and the risk profile

E MERITS OF LIQUID FUEL – VALUE RESTS IN THE SAFETY CASE

Central challenge is heat dissipation in all circumstances
Central pillar of Safety Case

CONTROL

ng negative reactivity
fficient of temperature
sive shutdown Safety Case

COOL

- Assures heat dissipation in all circumstances
- Fuel is a molten salt and also the coolant
  - Convective cooling of fuel
- A small reactor (400 MWth) that operates at 700 ˚C
  - Thermal radiative cooling 9x greater than a reactor core operating at 300 ˚C

CONTAIN

- Chemical containment
  - Salts chemically bind volatile fission products, Cs, I etc…
- No chemical driving forces
- Zirconium Metal-Water reactions absent
- No physical driving forces
  - Operates at one atmosphere

SR® Safety Case achieved with simple, natural and passive mechanisms that are secure and robust

SR® USED FUEL AND RADIOACTIVE WASTE – LESS AND OF HIGH MMERCIAL VALUE

R® operation generates 33% less waste within the fuel salt

- 33% less waste per kWh than LWRs
- Current generation of light-water reactors produce a substantial amount of plutonium
- IMSR® eliminates the isolation of plutonium as a pure material anywhere in reactor cycle

R® operation provides significant overall waste stream advantages

- Increased proliferation resistance
- Provides for a very high level of resource utilization/fuel burnup

R® spent fuel salt is a high commercial value waste stream

- Massive quantities of fission thermal energy remain
- Valuable material; not considered waste
- At decommissioning IMSR® spent fuel salts could be directly supplied as feedstock to a commercial recycling center

IMSR® generates less waste with increased proliferation resistance and a higher resource utilization capability than current light water reactors while retaining high commercial value at end of life

SR® USED FUEL AND RADIOACTIVE WASTE – MORE EASILY MANAGED

plified Used Fuel Management

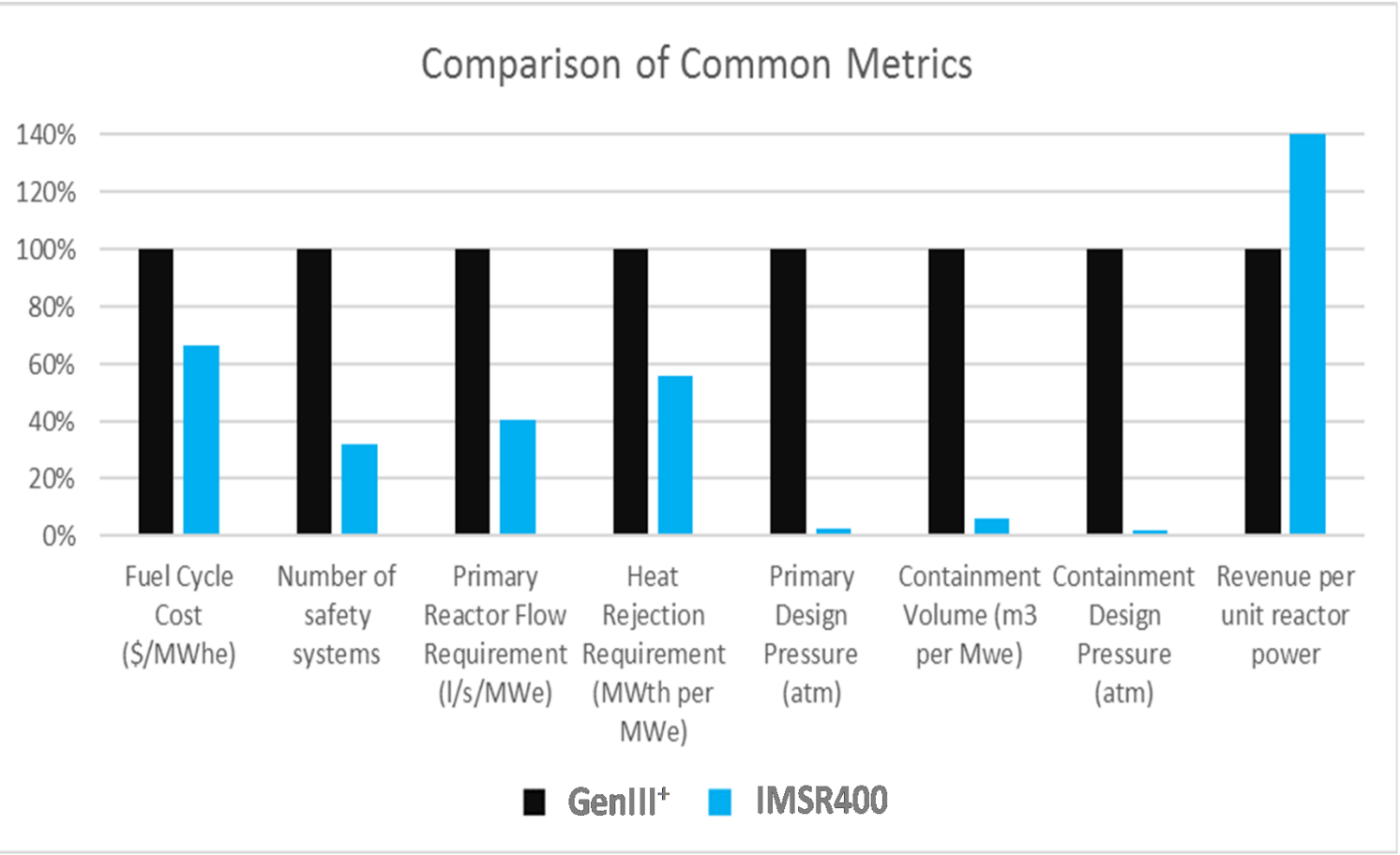
- At end of Core-unit life (7 years), IMSR® spent fuel salts are remotely transferred to a secure in-situ, non-accessible storage vault within the reactor containment
- Once transferred, spent fuel movement is not required for the remainder of plant life
- Current industry used fuel transfer operations are eliminated
- Spent fuel pool storage is eliminated, dry-cask storage and handling campaigns are eliminated
- Independent Spent Fuel Storage Installation (ISFSI) is eliminated
- Transferred from the storage vault to a long-term repository during decommissioning
- If directly supplied as feedstock to a commercial recycling center; all costly complex head-end steps are eliminated (disassembly, chopping, shearing, de-cladding, etc.)

ination of High Level Wastes for Decommissioning

- Spent IMSR® Core-units are flushed of fuel salts and high level radioactive constituents following shutdown
- Traditional high level waste reactor core internals are non-existent
  - IMSR® Core-units are managed, handled and treated as low-level waste
- By design, stored onsite for the entire plant life in secure individual storage silos within the Nuclear Island. Any proliferation risk is minimized.
- Balance of Nuclear Island components, vessels and secondary salt-circuit are lightweight, small, and easily disposed
  - Managed as low level waste during plant decommissioning

MSR® generates less waste that is easily managed, and is expected to have substantially lower overall management and decommissioning costs

ANTITATIVE COMPARISONS OF IMSR®400 TO A LEADING ADVANCED N III+ DESIGN



NTACT DETAILS

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