GE Nuclear Energy

ESBWR Deployment Plan

January 13, 2004

Rockville, Maryland

ESBWR Background

- Emphasis on simplification
  - Reduced systems and buildings
  - Increased operational and safety margins
- Significant improvement in plant economics
  - Economies of scale – no technical limit on power output
  - Reduced (by 6mo.) construction schedule and O&M cost
- Solid technology base and strong delivery team

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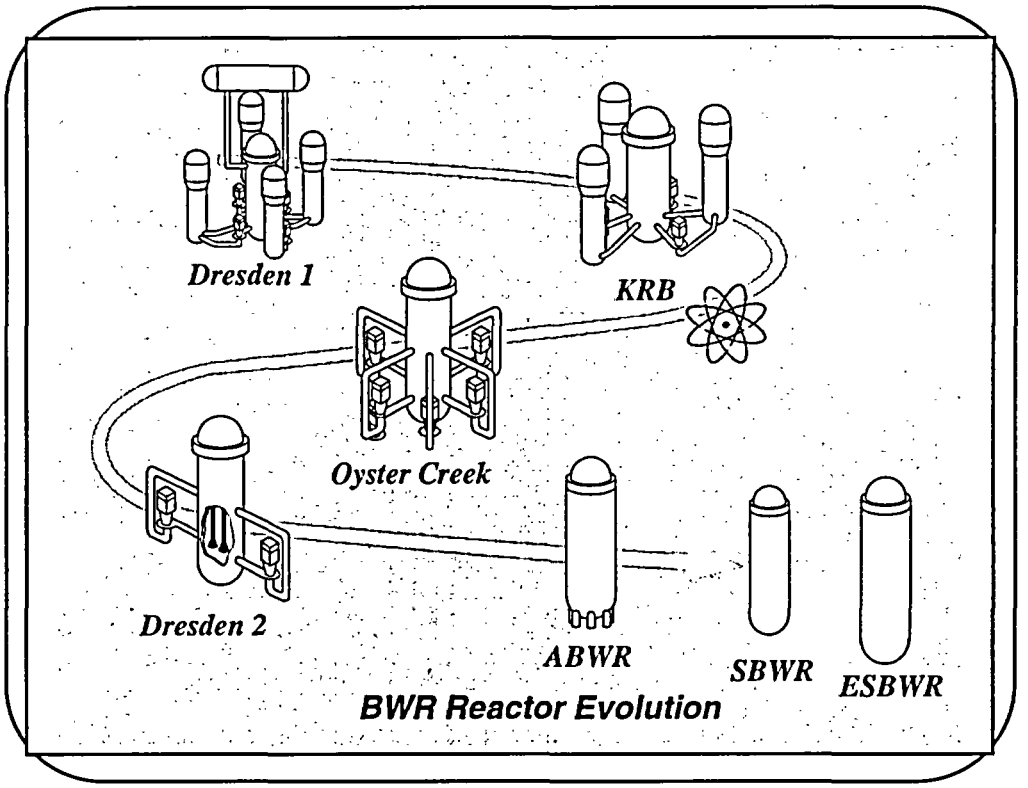
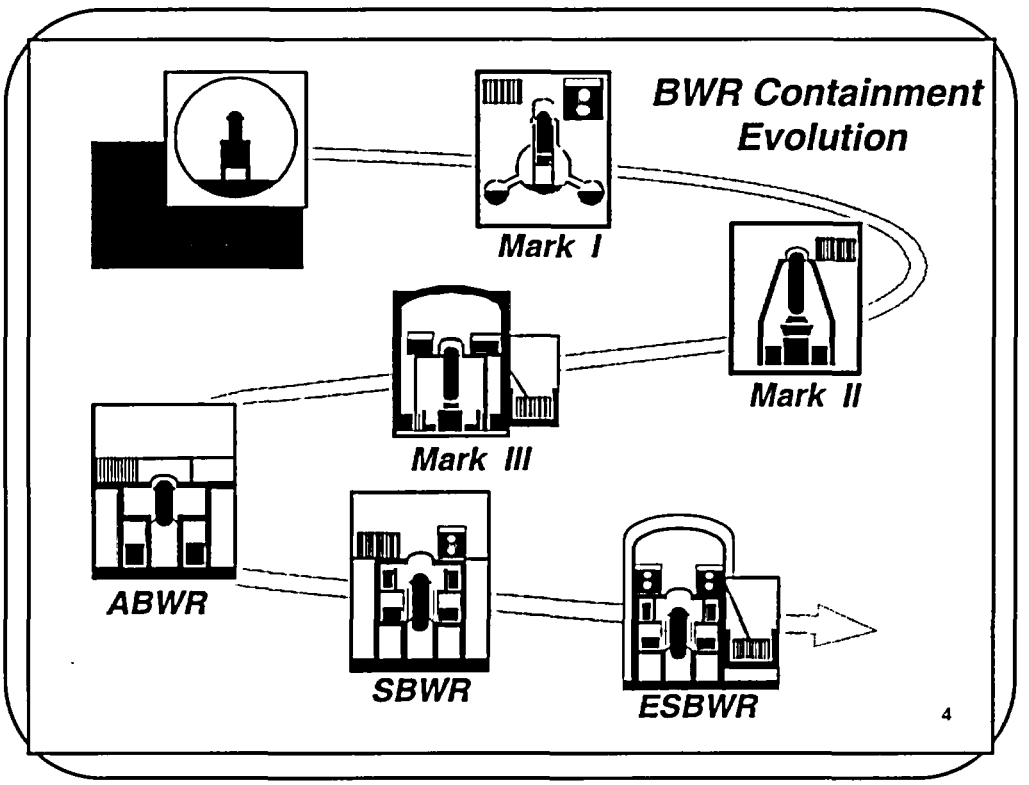

Dresden 1
KRB
Oyster Creek
Dresden 2
ABWR
SBWR
ESBWR
BWR Reactor Evolution


BWR Containment Evolution
Mark I
Mark II
Mark III
ABWR
SBWR
ESBWR
4

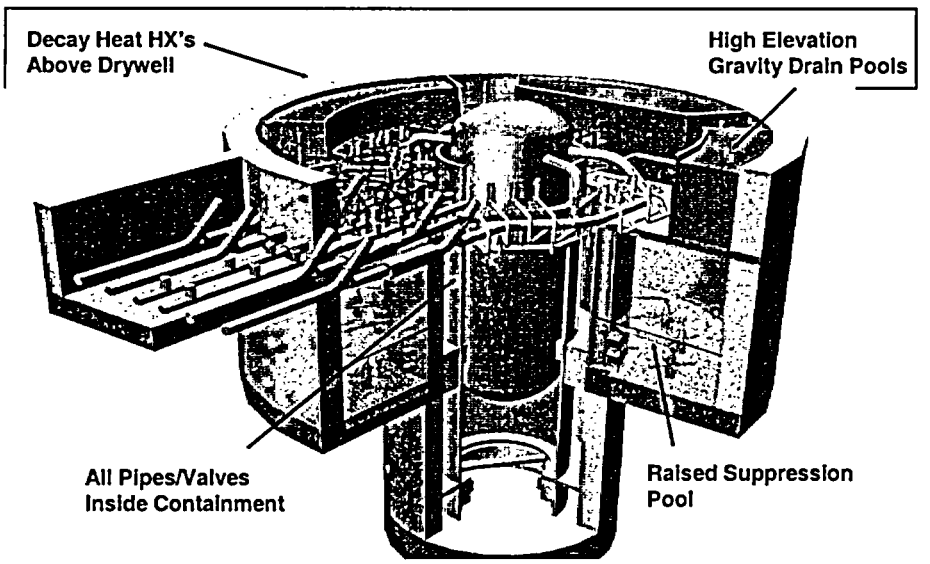
Comparison of Key ESBWR Parameters to Operating BWRs

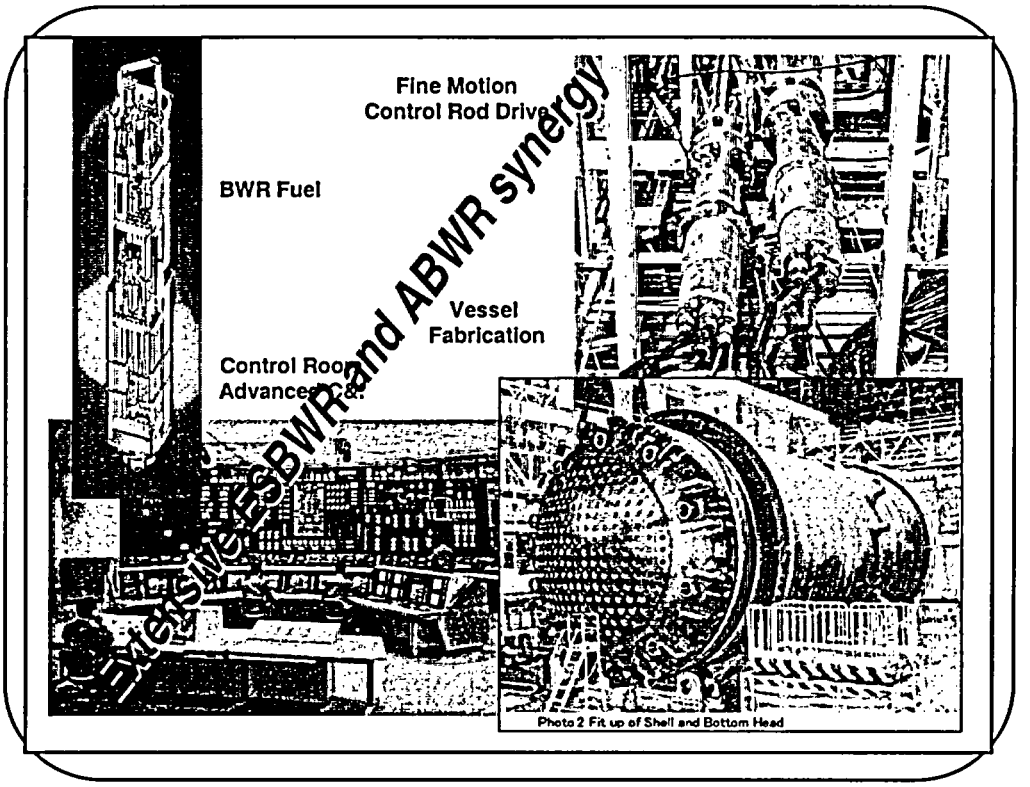
Parameter	BWR/4-Mk I (Browns Ferry 3)	BWR/6-Mk III (Grand Gulf)	ABWR	ESBWR
Power (MWt/MWe)	3293/1098	3900/1360	3926/1350	4000/1390*
Vessel height/dia. (m)	21.9/6.4	21.8/6.4	21.1/7.1	27.7/7.1
Fuel Bundles (number)	764	800	872	1020*
Active Fuel Height (m)	3.7	3.7	3.7	3.0
Power density (kw/l)	50	54.2	51	54*
Recirculation pumps	2(large)	2(large)	10	zero
Number of CRDs/type	185/LP	193/LP	205/FM	121*/FM
Safety system pumps	9	9	18	zero
Safety diesel generator	2	3	3	zero
Core damage freq./yr	1E-5	1E-6	1E-7	1E-7
Safety Bldg Vol (m^3/MWe)	115	150	160	70*

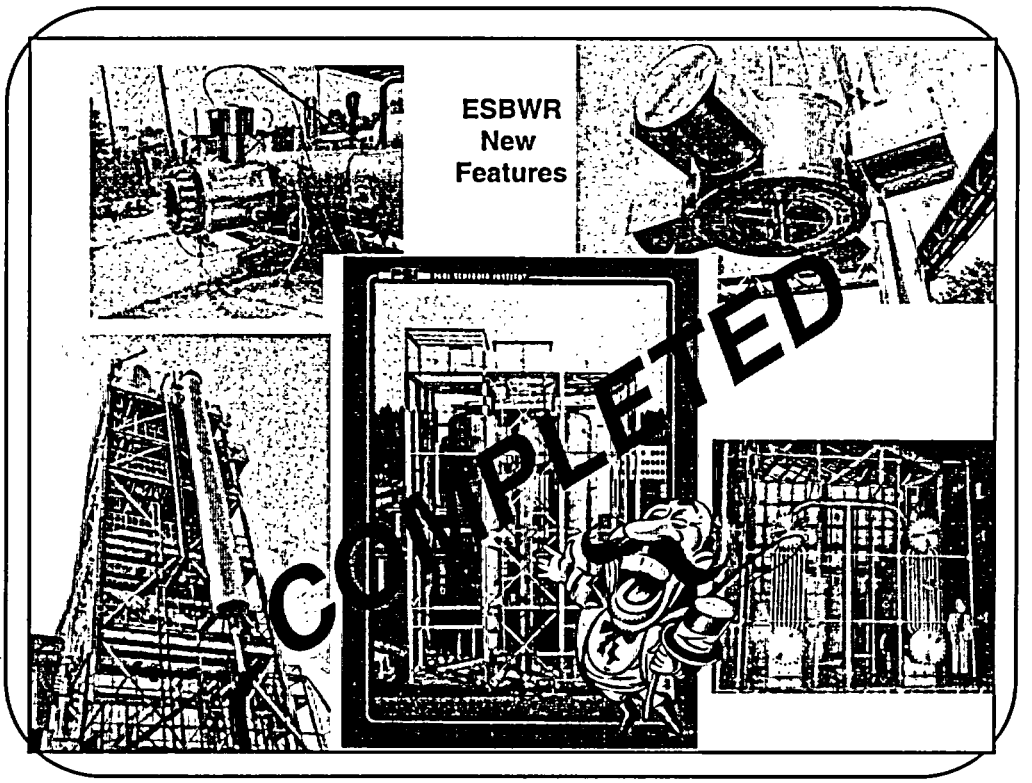
[redacted]

*optimization changes possible

Passive Safety Systems Within Containment Envelope – Improved safety and security

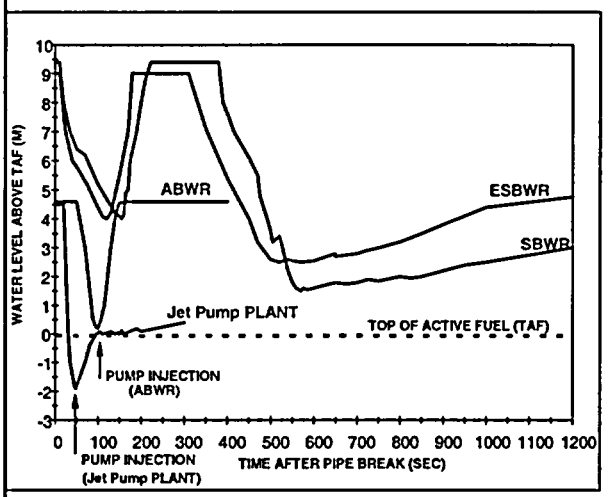


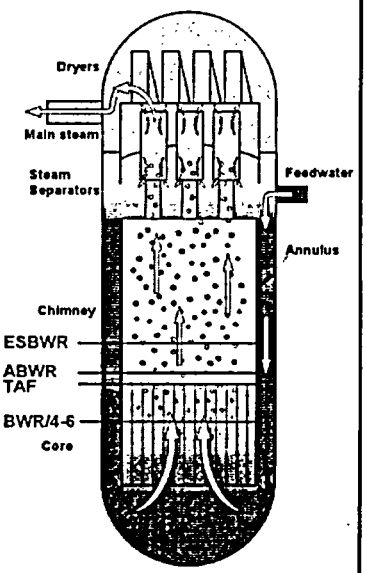

Fine Motion
Control Rod Drive
BWR Fuel
Vessel
Fabrication
Control Room
Advances
ESBWR and ABWR synergy
Photo 2 Fit up of Shell and Bottom Head


ESBWR
New
Features
COMPLETED

Water Level in Shroud Following a Typical Pipe Break

(values are intended to show typical trends for limiting breaks)





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Deployment Steps for the ESBWR

- *Design Certification – a stepwise and accelerated schedule*
  - *Passive safety systems technology*
  - *Natural circulation and stability*
  - *Severe accident and Probabilistic Safety Assessment (PSA)*
  - *Systems and buildings*
  - *Optimization of the plant design before submittals completed*
- *Construction and Operating License (COL) inputs*
- *Detailed engineering and acceptance testing*

Summary and conclusions

- *ESBWR is a simpler, economic plant design*
- *Schedules and costs presented are practical and realistic*
  - *Development schedules are based on recent experiences*
  - *Program takes advantage of ABWR detailed design*
- *Infrastructure and strong delivery team ensure that construction targets can be met*

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ESBWR Stability Submittal Status

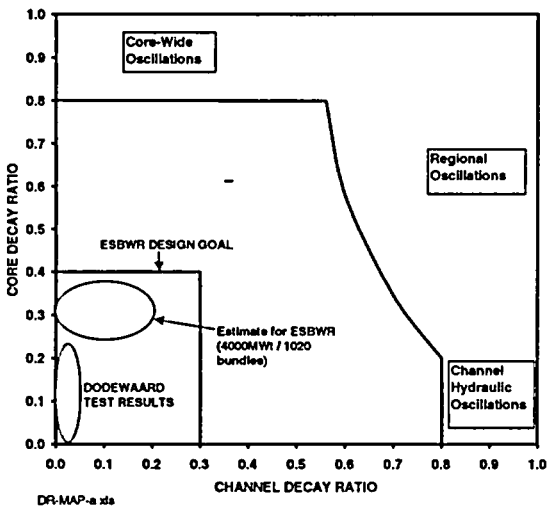
1/13/2004

Stability Design Criteria

- Key Premise
  - Maintain large margin to core wide and regional stability for steady state and transients
  - Similar to "flow control range" in operating plants
- Core decay ratio vs. Channel decay ratio map useful for stability margin evaluation
  - Based on BWR stability data and with allowance for analysis code uncertainty

BSS - 2

ESBWR Stability Criteria



BSS - 3

Stability LTR Status

- *Background and approach discussed with NRC Staff and consultant 10/1/2003*
- *TRACG will be used as primary analysis tool*
  - *Accommodates geometrical complexity of partitioned chimney*
- *Analysis of*
  - *Single channel stability*
  - *Single cell (16 bundle) stability*
  - *Core wide stability*
  - *Regional stability*
- *Analysis of startup from cold conditions to define optimum startup path*

BSS - 4

Stability LTR Content

- *Identification of PIRT parameters*
- *Nominal calculations of decay ratio*
- *Sensitivity studies*
- *Determination of uncertainties in models and initial conditions*
- *Meet design goal of core decay ratio of 0.4, channel decay ratio of 0.3 (best estimate)*
- *Meet design limit with 2σ margin*
- *Calculations at:*
  - *Rated conditions (least stable)*
  - *End points of transients from rated conditions calculated by TRACG*
- *LTR submittal in July 2004*

BSS - 5