The SMR Bandwagon
Staying Onboard

Presented by Jack A. Bailey
VP Nuclear Generation Development

NRC Regulatory Information Conference 2012
March 12, 2012

Nuclear Projects at TVA

	Under Construction	*Engineering/Licensing*	*Studies*
			
	Watts Bar 2	**Bellefonte 1**	**Clinch River SMR**
Commercial Date	2014	2020	TBD
TVA Megawatts	7,780 MWe	9,040 MWe	TBD

2

Current Studies Focused on Addressing Three Critical Areas

- Licensing Efficiency and Certainty
- Deployment Certainty
- Production Cost Certainty

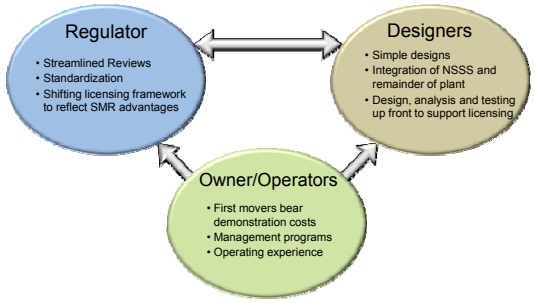
3

Licensing Efficiency and Certainty

Early Thinking	Current View
▪ **10CFR50 preferred approach** for first-of-a-kind	▪ Either Part 50 or Part 52 depending on project team goals. One design, one review
▪ Smaller, simpler designs result in **simpler reviews and justifications**	▪ Regulatory simplification changes will be incremental and design specific
▪ **Regulatory process changes** needed to address SMR unique improvements	▪ Few generic issues identified; design-specific licensing changes determined during the design certification.
▪ **Emergency planning** zones or requirements less	▪ Regulatory source term changes needed and difficult, near term potential benefits unlikely
▪ **Security staffing** requirements can be less	▪ Reductions design specific and yet to be confirmed
▪ **Environmental reviews** simpler	▪ Additional questions in new areas

4

Realizing Licensing Efficiency and Success



Need industry to act on regulator invitations to engage

5

Deployment Certainty

Early Thinking	Current View
▪ **Increased Siting Options**—ease of siting challenges	▪ Site selection and multiple sites may not be easier.
▪ **Underground containments** provide licensing, safety and security advantages.	▪ Still true, but increases construction and site characterization costs.
▪ **Incremental** single module addition of SMR units as needed	▪ Option must be planned for and invested in upfront.
▪ **Total Costs** can remain competitive with base load generation alternatives	▪ Not with sustained low gas prices and no cost for carbon… but SMRs appear competitive with large reactor single units.
▪ **Designer teams** will provide standardized integrated project capability and long-term commitment.	▪ Same expectations, but not developed yet.
▪ Economy of scale offset by **economy of manufacturing**	▪ Considerable site assembly and civil/structural work required … but should improve over time

6

Look beyond cost/kw when determining cost-competitiveness

Construction Period Finance Drivers

	Large Unit (1100-1200 MW)	SMRs (2 or more units) (250-400 MW equivalent)	
Total escalated cost per unit(s)	$6 - 8 Billion	$1.5 - 2.0 Billion	Less strain on balance sheet
Construction duration First concrete to fuel load	42-54 mo.	24-30 mo.	Quicker completion Less interest cost
Site preparation work	18-24 mo.	12-18 mo.	
Percent of EPC contract price fixed	40-60%	60-80%	Less risk Lower cost of capital

Benefits could be equivalent to $400-$500/kw of relative benefit

7

Production Cost Certainty

Early Thinking

- **O&M costs** expected to be higher but can be partially offset with regulatory and design enhancements.
- Longer **refueling cycles** are better.
- **Highest reliability** as a design objective.
- **Centralized regional** training and engineering support desirable. SMR fleet concept.
- **Possible shared systems**. Multiple reactors per turbine.

Current View

- Operating costs still higher and dependent on plant design, layout and separation between units…Gap not a showstopper and will narrow with more modules.
- Ease of refueling, fuel costs, and resource management for refueling are also important.
- Given the small MW loss, perhaps reliability tradeoffs are appropriate.
- Shifting to an SMR fleet model for training and maintenance will not be realized by first movers.
- Independent units for safety significant features.

8

Key First Mover Considerations

- Overall staffing levels
- Optimum design cycle lengths
- Plant Infrastructure development, procedures, training, etc.
- Refueling outage frequency and duration – full-time refueling teams or contract as service
- Additional testing and demonstration requirements
- First plant operating reliability

First mover challenges and risks need to be shared by multiple parties.

9

Summary

- SMRs should be regarded as an important option for clean reliable energy supply in the next decade and beyond.
- Shifting existing licensing, deployment and operations frameworks requires efforts from the regulator, the designers and the owner/operators.
- Our ability to find ways to reduce the cost burdens on new nuclear development and operation will ultimately determine the degree of success of SMRs.

10