Development Path with FIRE

Response to E4

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for the FIRE Study Team

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http://fire.pppl.gov

Critical Issues to be Addressed in the Next Stage of Fusion Research

- **Advanced Toroidal Physics**
  - develop and test physics needed for an attractive MFE reactor
  - couple with burning plasma physics

- **Boundary Physics and Plasma Technology** (coupled with above)
  - high particle and heat flux
  - couple core and divertor
  - fusion plasma - tritium inventory and helium pumping

- **Burning Plasma Physics** (coupled with above)
  - strong nonlinear coupling inherent in a fusion dominated plasma
  - access, explore and understand fusion dominated plasmas

- **Neutron-Resistant Low-Activation Materials**
  - high fluence material testing facility using “point”neutron source

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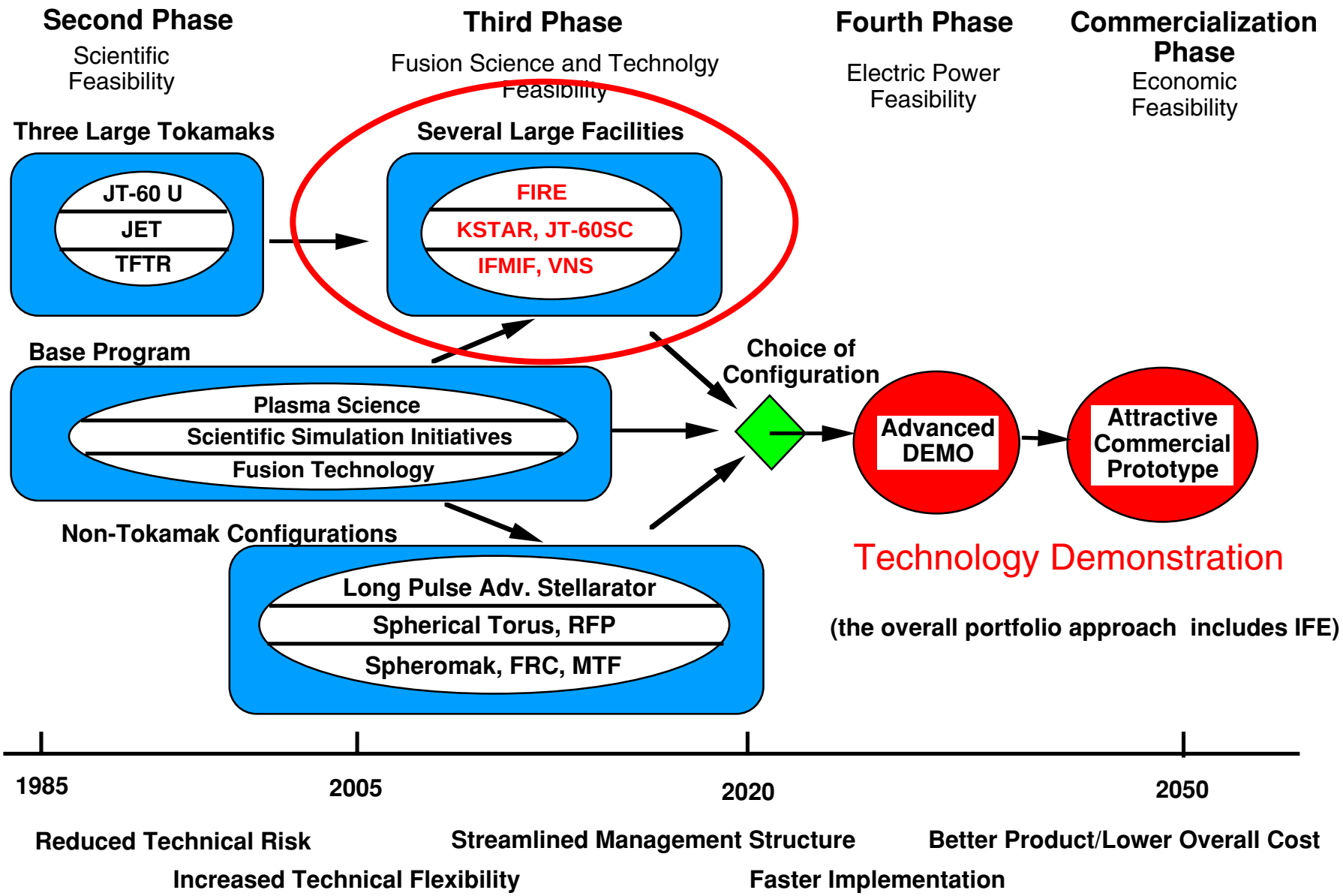
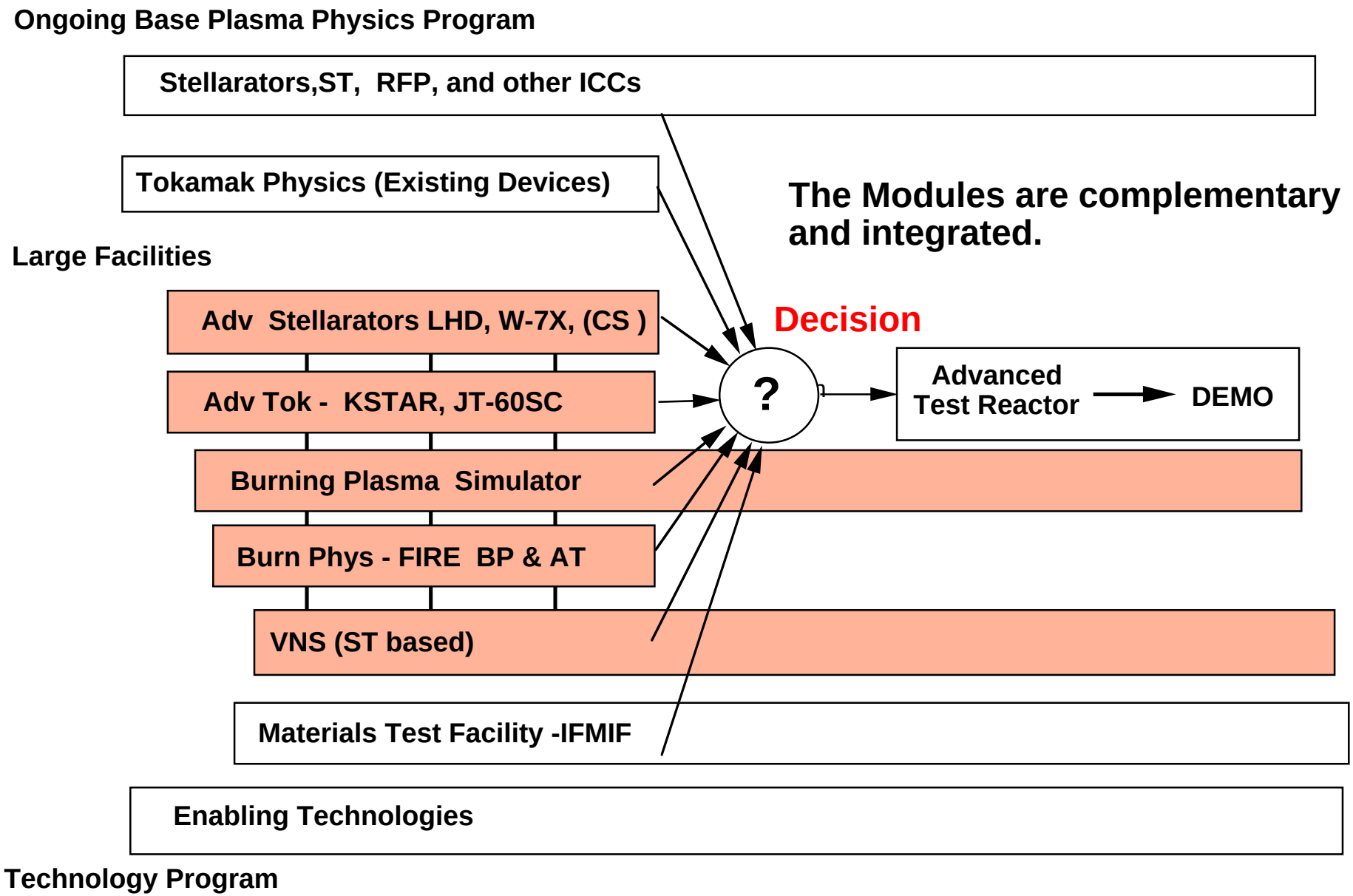
  - high fluence component testing facility using volume neutron source

- Superconducting Coil Technology does not have to be coupled to physics experiments - only if needed for physics objectives

A “Lower Cost More Efficient Path” to Fusion Energy



Integrated International Diversified Portfolio (FIRE Based)



A more complete "integrated " result would be available for the decision point than would be available with the ITER Based approach.

Elements for the Next Phase of FIRE-Based International Portfolio

Base Physics and Technology program
Ongoing Advanced Tokamak program (DIII-D, C-Mod, AUG, JET,…)
Ongoing Large Stellarator Program (LHD, W-7X, … CS)

New Initiatives and Facilities		Capital Cost
KSTAR	$0.3B	
JT-60 SC		$0.5B
FIRE		$1.2B
Magnetic Fusion Simulator		
Comprehensive/integrated simulation of BP/AT including non-tokamak configurations		$0.5B
Fusion Materials Test Facility(s)		
Intense Neutron Source		$0.8B
Volume Neutron Source (ST)		$1.5B
PFC Test Facility		$0.1B
Advanced Magnet Development facility		$0.1B
Others		
Total		**$4.7B**