

# **Discussion Of Compact Stellarator Reactor Requirements**

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# Purpose of Requirements List

**This list of requirements highlights those items that might be beneficial for examination by the ARIES Team**

**As the design evolves, this list will become more complete**

**Please examine the following list to quantify the requirement, add a new one, or eliminate an existing one**

# Tentative List of Requirements

Overall Plant Requirements (Najmabadi)			
Net electric power requirement, MWe	1000	1500	2000
Thermal conversion efficiency goal, %	49	59	
Alpha Confinement Guidelines			
Flux Surface Quality Guidance			
Coil Geometry and Engineering Data (Heitzenroeder, Bromberg)			
S/C materials	SC	HTC	
Degree of Modularity (# of Periods)			
Number of coils per Period (function of periods)			
Winding Pack Configurataion/Size/Aspect Ratio			
Maximum Field Strength, Tesla			
Coil Bend Radius, m			
Coil Currents, MA/Coil			
Power Requirement, MW total			
Coil to Coil Separation, m (Access related)			
Need for TF Coils			
Need for PF Coils			
Need for Trim Coils			
Use of Tilted Coils?			

# Tentative List of Requirements

## First Wall/Blanket/Shield Definition (Raffray)

Materials

Thickness by Region over FW Surface, m

Neutron Wall Loading by Region (Goal)

Surface Heat Flux by Region (Goal)

Total Area by Region, m<sup>2</sup> (Determined data)

## Divertor Definition (Raffray)

Materials

Thickness by Region over FW Surface, m

Neutron Wall Loading by Region (Goal)

Surface Heat Flux by Region (Goal)

Total Area by Region, m<sup>2</sup> (Determined data)

# Tentative List of Requirements

Nuclear Performance, Shielding, and Radial Build (El-Guebaly)			
Breeding and Shielding Requirements			
Neutron Wall Loading Profile			
Overall TBR			
Overall Neutron Multiplication			
Goal Radiation Damage and Lifetime			
Minimum Radial Distance FW to Coil Midpoint, m			
Goal Activation and Waste Level			
Remote Maintenance Goal?			
Plasma Definition (Zarnstorff, Pu)			
Number of Periods			
Beta Limit			
Profile Effects			
Fusion Power Level (related to effcy, MWe)			

# Tentative List of Requirements

Plasma Startup/Control Definition (Mau)		
Plasma Startup/Control Approach		
Access Requirement		
Replacement Frequency, yr		
Conversion Efficiency, %		
Total Power Requirement, MW		
Access/Maintenance Definition (Wagner, Malang)		
Maintenance Approach		
Maintenance Frequency		
Access Requirements		