



***CoalFleet
for Tomorrow[®]***

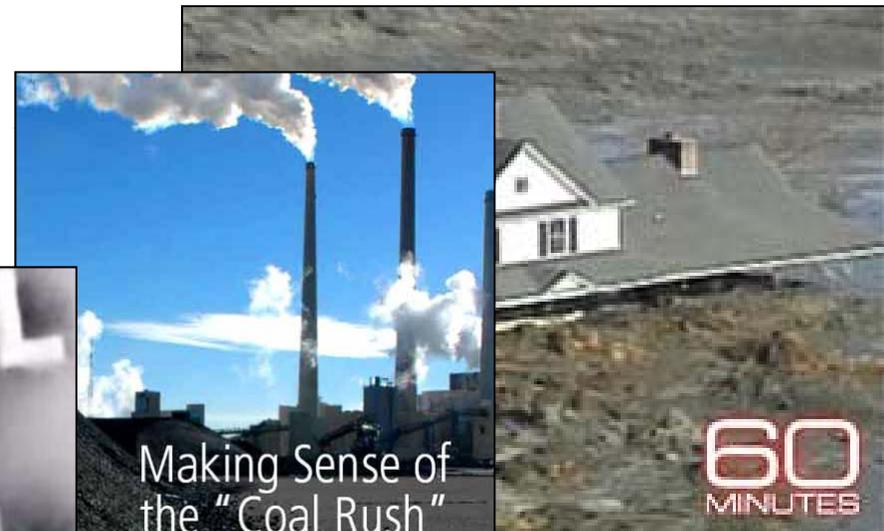


EPRI's Perspective on High-Hydrogen Syngas Gas Turbines

***Rob Steele
EPRI***

Actually, there hasn't been much "debate..."

- A debate implies contrasting views ... and there hasn't been a lot of support for coal lately, at least in media



The Consequences of Expanding America's Dependence on Coal

U.S. PIRG Education Fund
National Association of State PIRGs

IN REALITY, THERE'S NO SUCH THING AS CLEAN COAL.
THE COAL INDUSTRY IS SPENDING MILLIONS ADVERTISING CLEAN COAL, BUT NOT A SINGLE CLEAN COAL POWER PLANT EXISTS IN THE US TODAY.

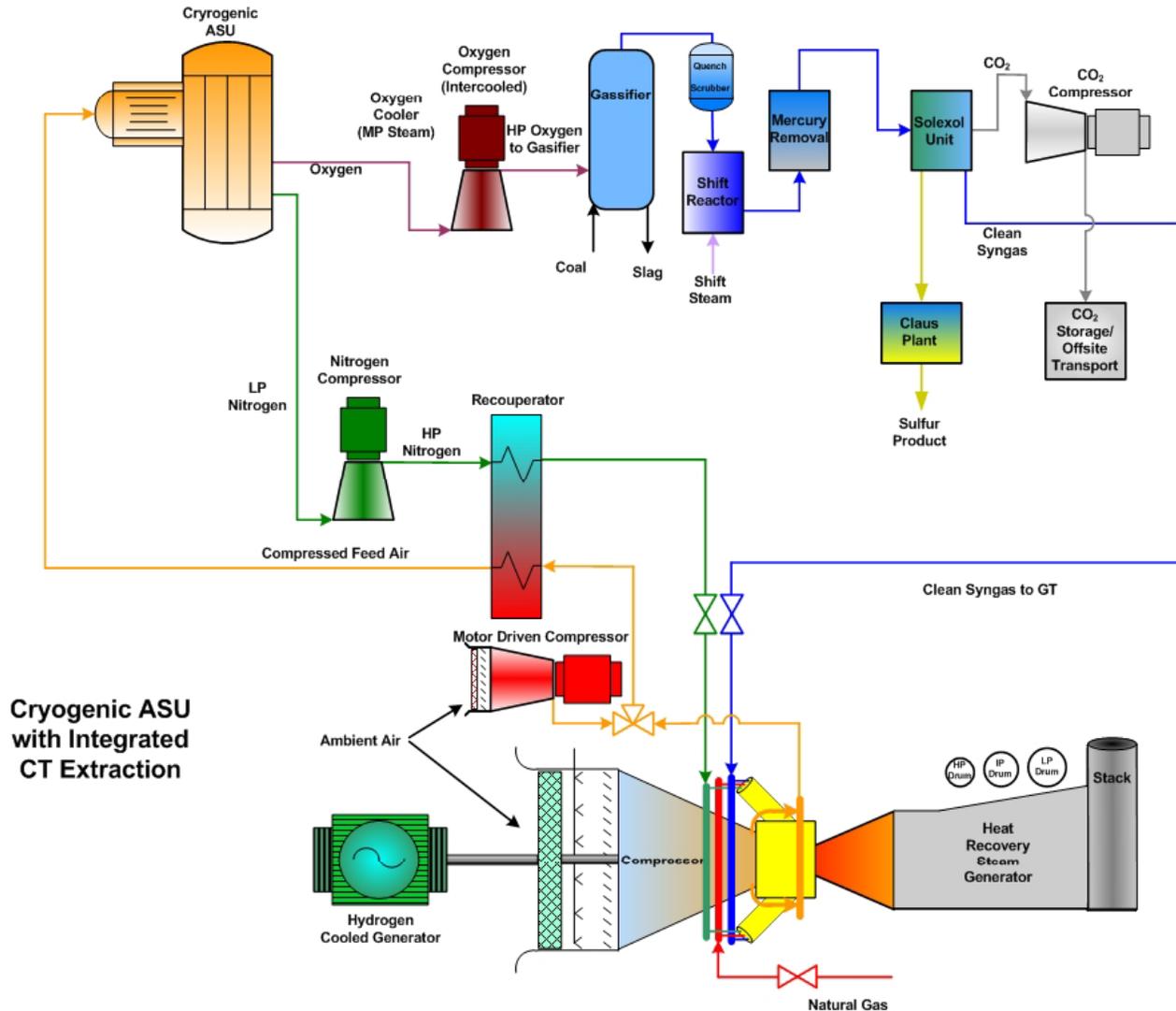
Strong voices for coal are still out there

“I believe we must make it our goal to advance **carbon capture and storage technology to the point where widespread, affordable deployment can begin in eight to 10 years. It will require an aggressive global effort, harnessing the scientific talent and resources of governments as well as industry.”**

*-- U.S. Department of Energy Secretary
Steven Chu, speaking Oct. 12 at the
Carbon Sequestration Leadership
Forum meeting in London*



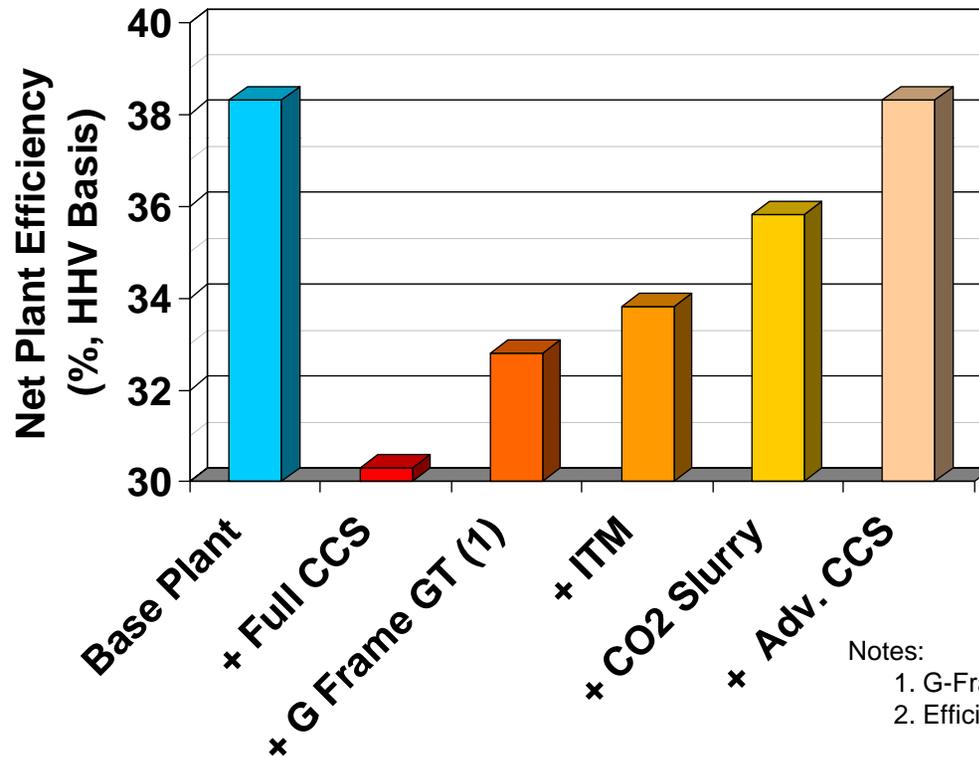
IGCC ASU with Integrated Gas Turbine



IGCC Improvement Potential



Future Potential



Notes:

1. G-Frame GT case includes full air-side GT-ASU integration
2. Efficiency improvements are cumulative

EPRI Supporting Roadmap via Demo Projects and Technology Innovation

Recommended R&D Needs

Increase efficiency of IGCC + CCS systems:

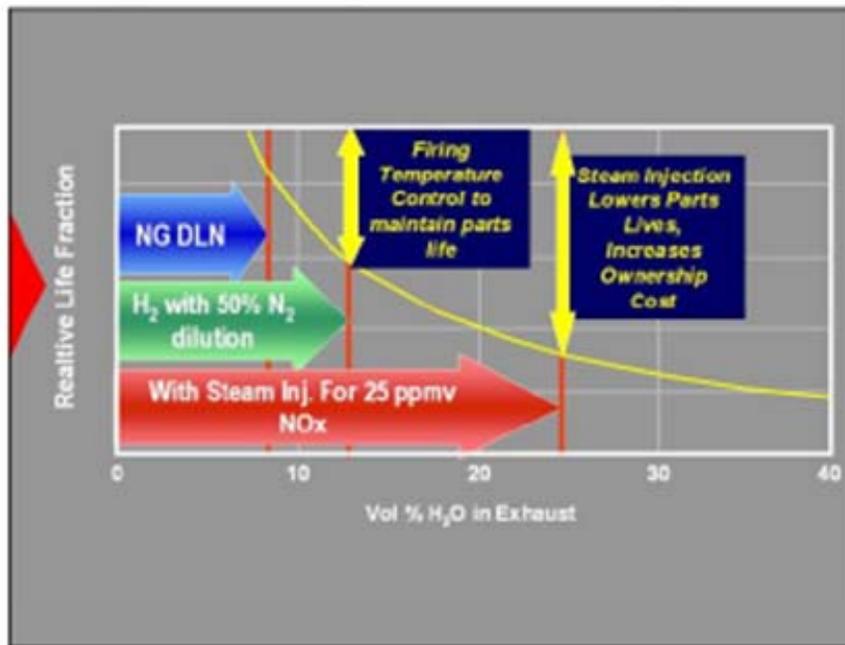
- Improve GT integration with Air Separation Unit
- Modify GT for lower pressure requirement for N₂ diluent
- Design for high H₂ syngas without derating firing temperature
- Improve combustor design for low NO_x control for high H₂ syngas
- Offer larger MW GT for economy-of-scale advantage (G, H, J, ?)
 - MHI 320 MWe J-series (1700°C, 3100°F)
- Improve high altitude performance
 - Adds efficiency penalty when compared with PC plants

Increase efficiency of NGCC + CCS systems:

- Recycle exhaust from HRSG will decrease CO₂ capture costs
- Improved NO_x control

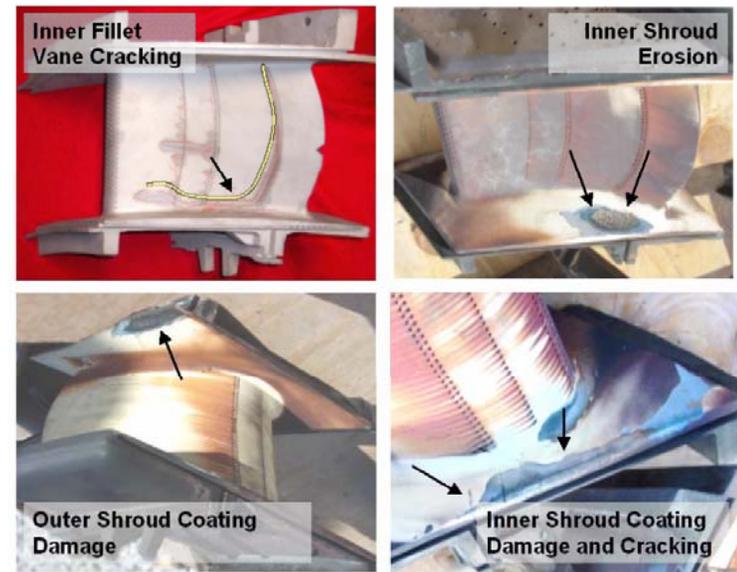
#1 Need: Must INCREASE Firing Temperature of High Hydrogen Syngas Gas Turbines

Reliability/Availability/Maintainability



Source: GE

1st Stage Nozzles



Source: Siemens

Higher H₂O Content Reduces Life of Turbine Hot Section



Questions?

Together...Shaping the Future of Electricity