

U.S. DEPARTMENT OF
ENERGY

Office of Fossil Energy and
Carbon Management

Carbon Pollution Free Energy Sector by 2035 and DOE Strategies for Transition

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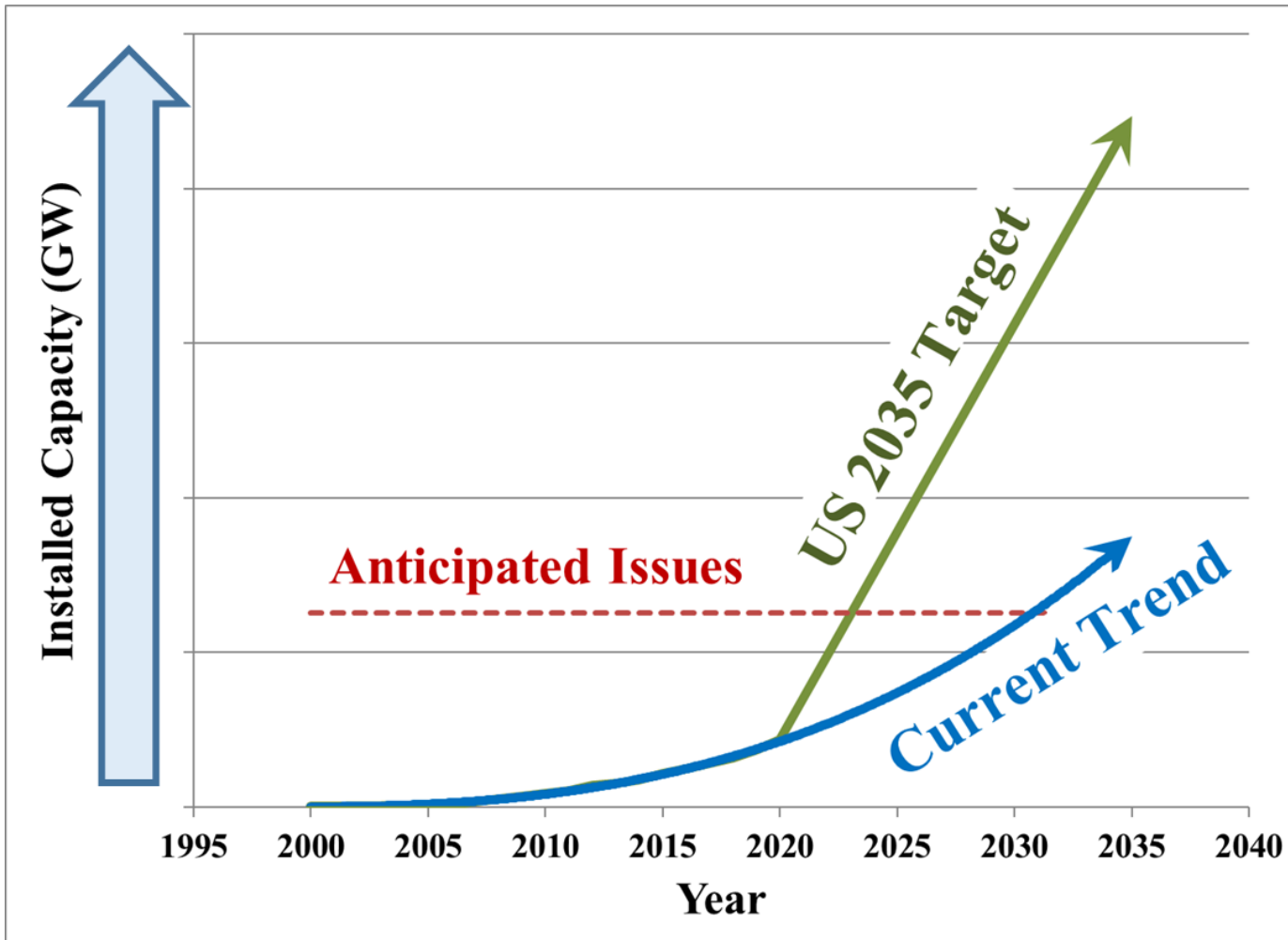
**6th Low Emission Advanced Power
(LEAP) Workshop**

Session 1: Goal Net-Zero

November 1, 2021

U.S. Executive Order 14008

Combined Solar and Wind

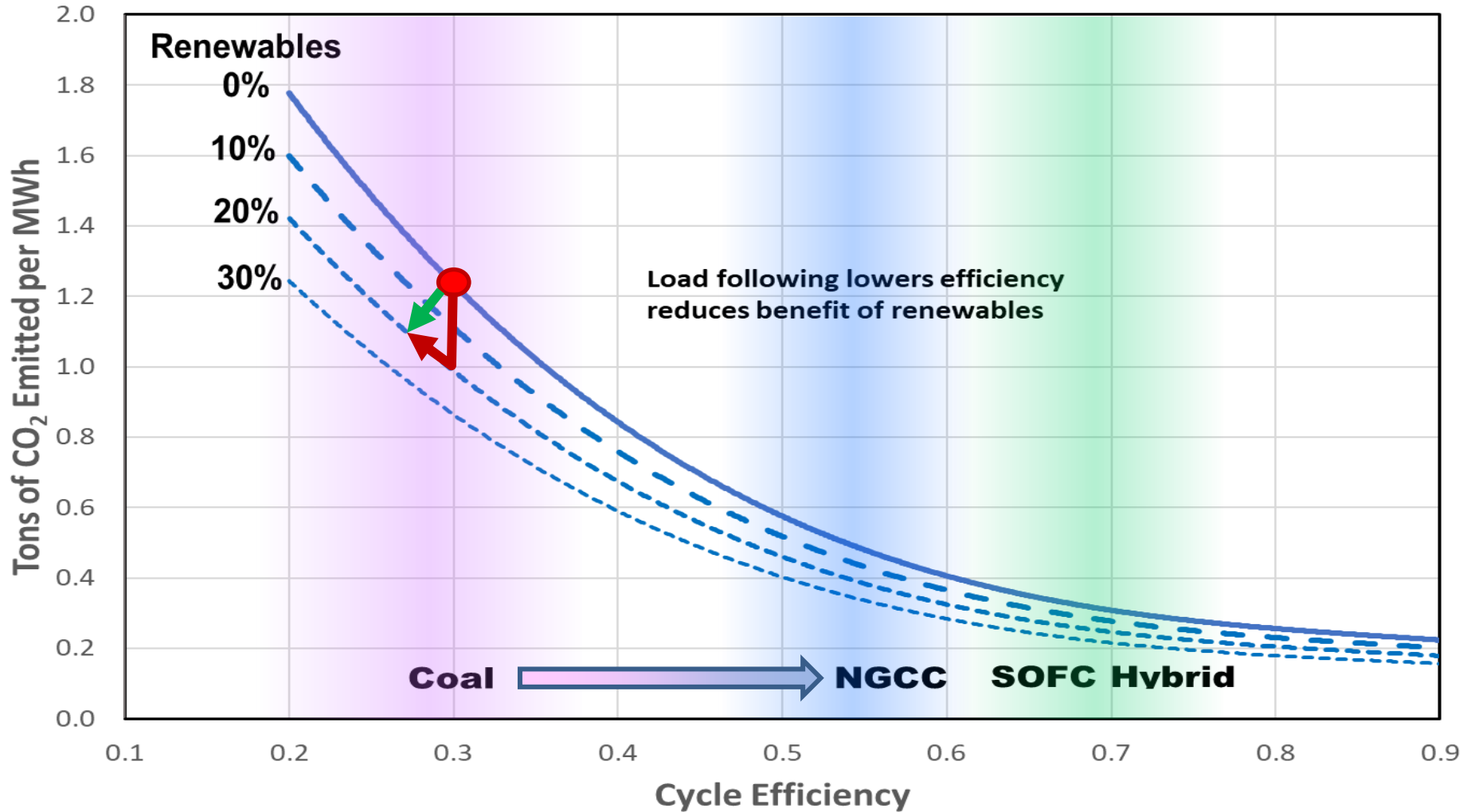


From EO 14008, Sec 205:
"The plan shall aim to use, as appropriate and consistent with applicable law, all available procurement authorities to achieve or facilitate: (i) **a carbon pollution-free electricity sector no later than 2035**"



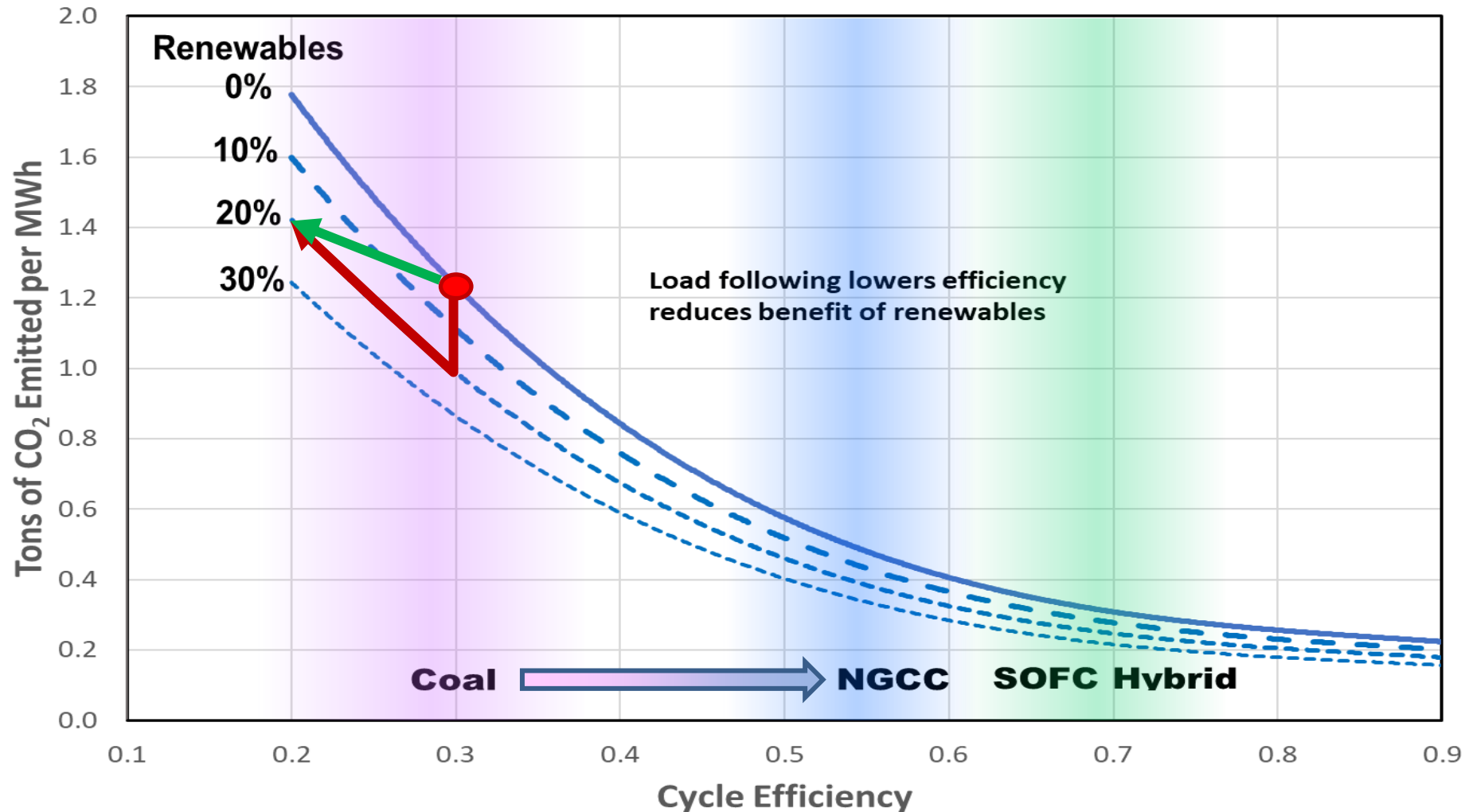
Managing Carbon During the Transition

Net Decrease



Managing Carbon During the Transition

Net Increase



Looking to Integrated Energy Systems- A Global Perspective

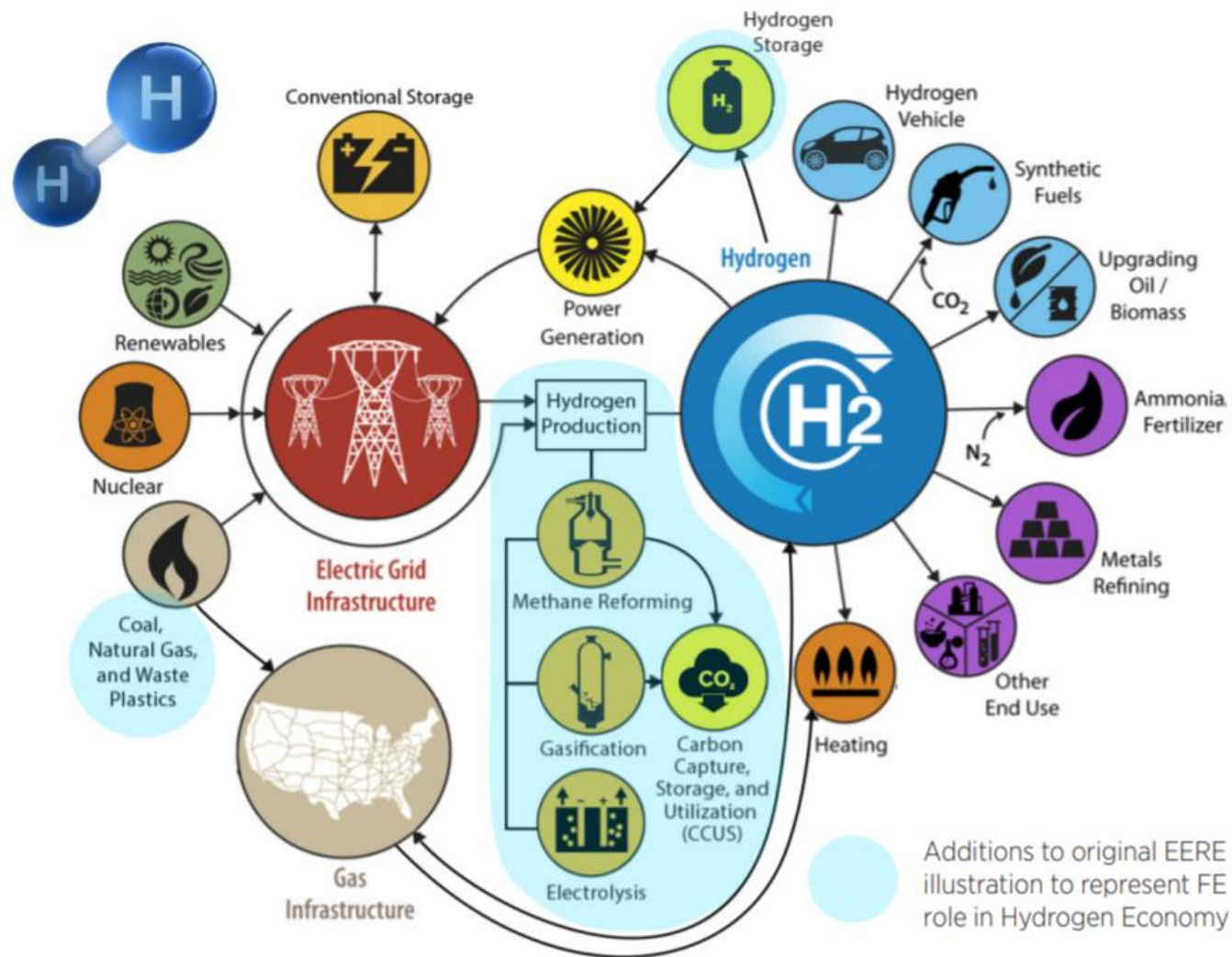
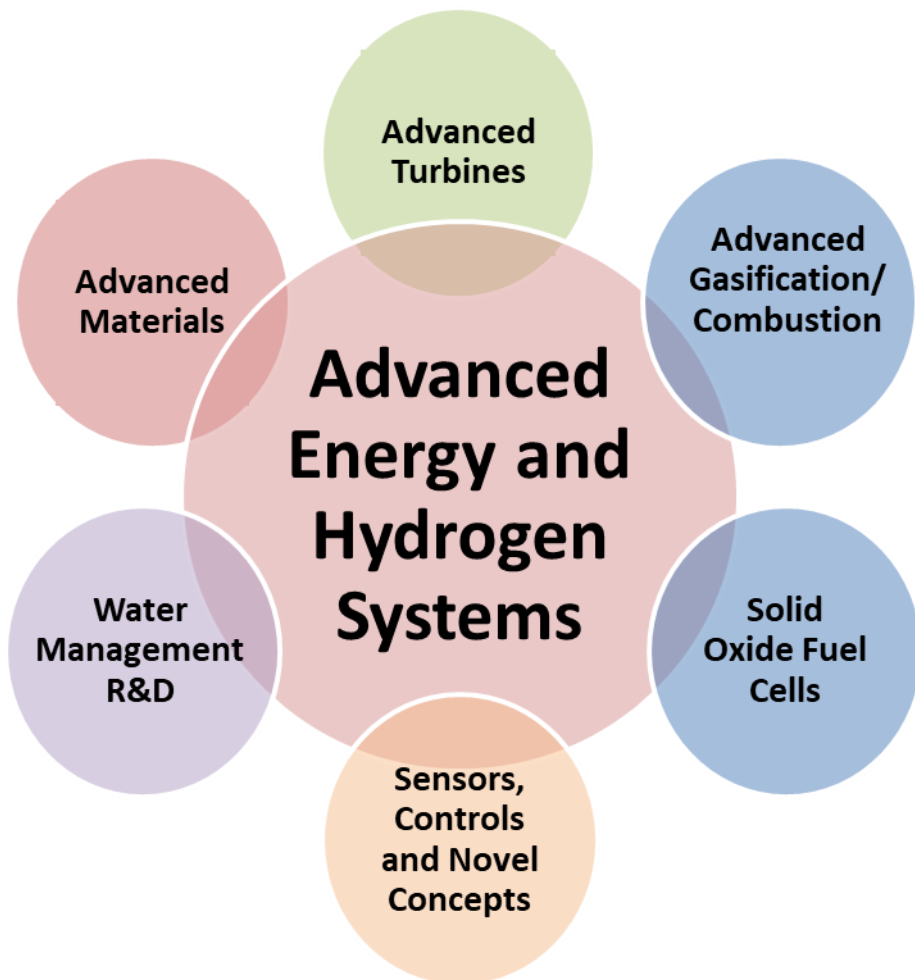


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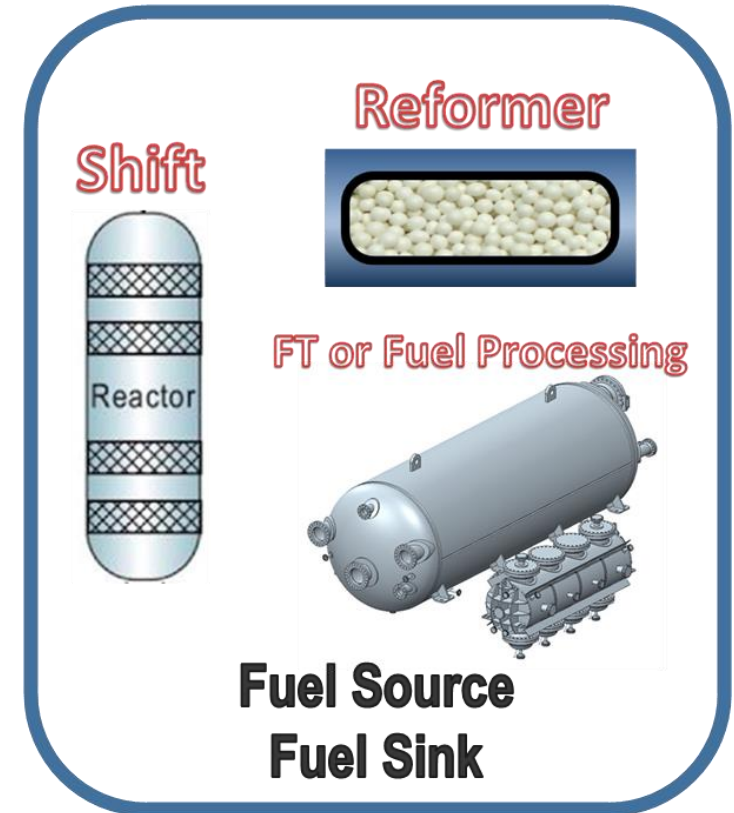
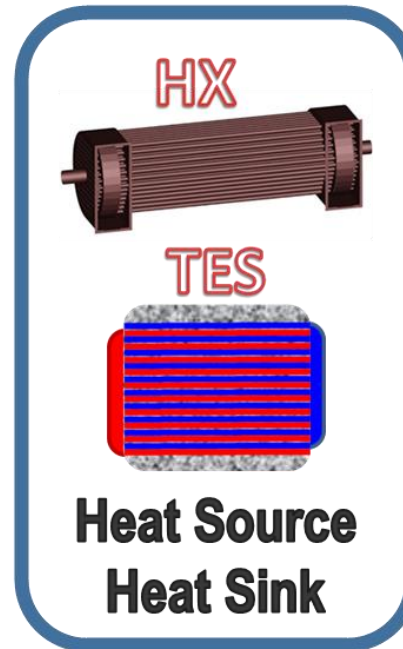
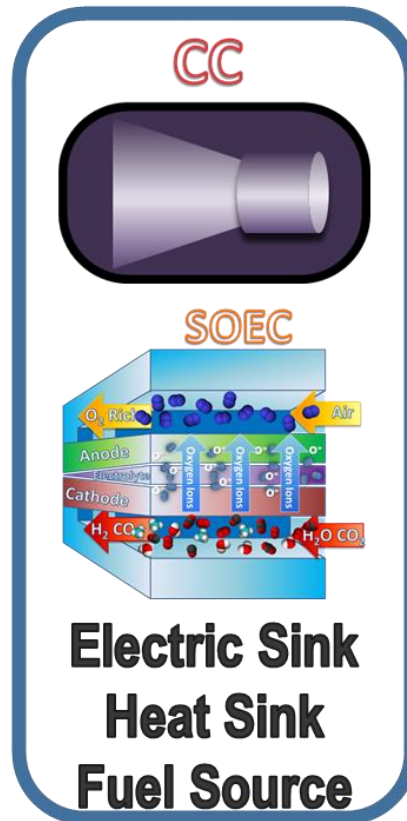
Office of
Fossil Energy

FECM Technology Supporting the Transition

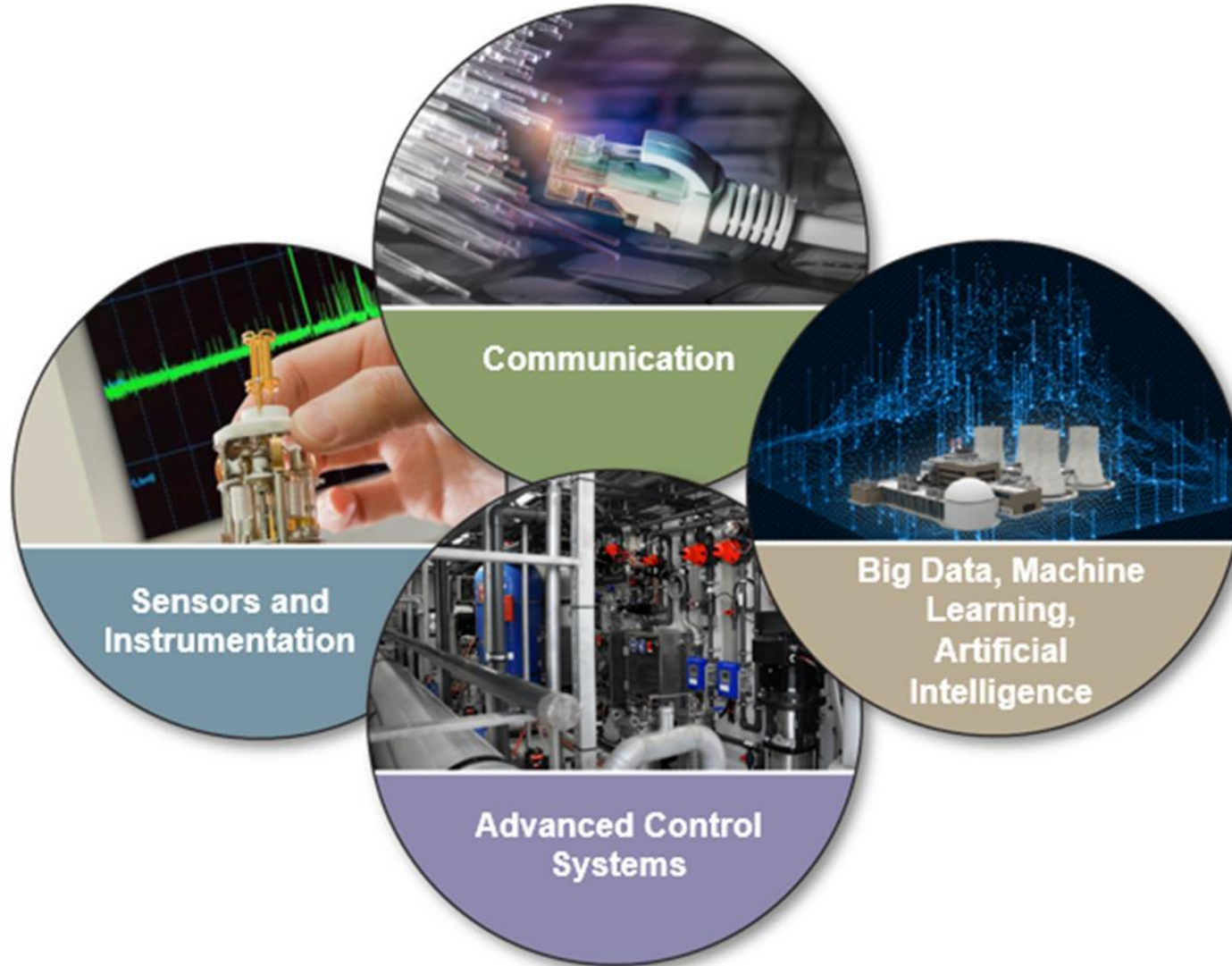
Six Subprogram Activities



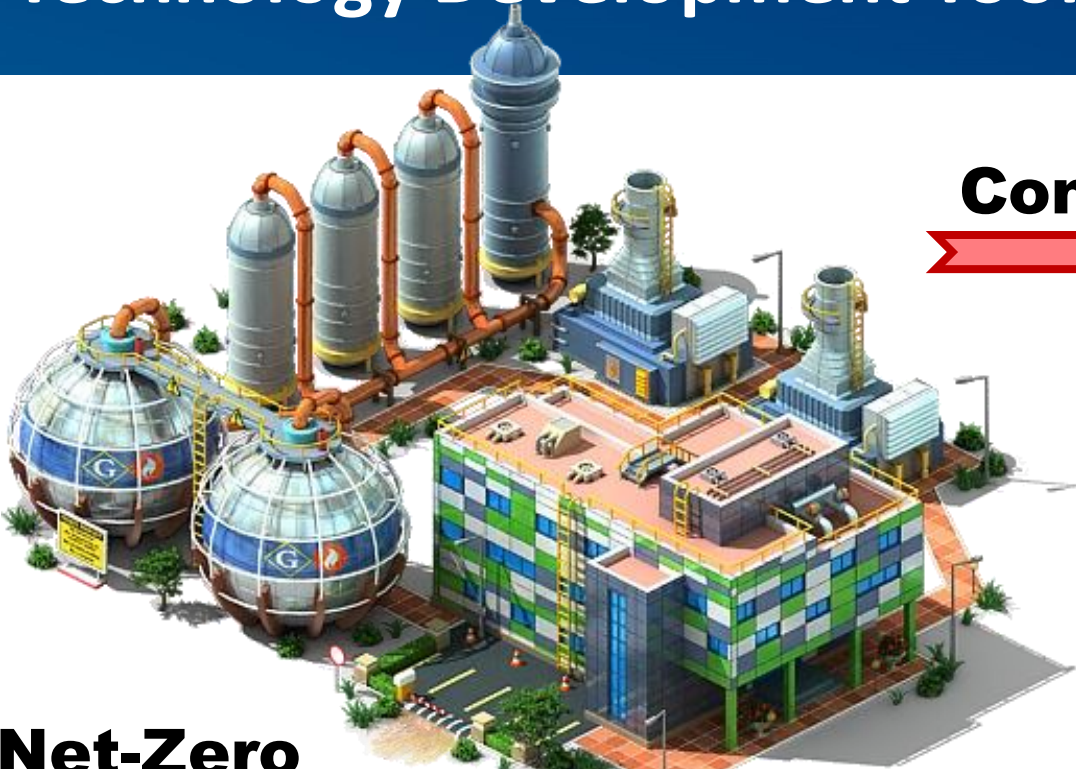
Novel Cycle Concepts and Key Components



System Integration, Sensors, and Controls



Technology Development Tools



**Net-Zero
Power Generation
Realized**

Concept

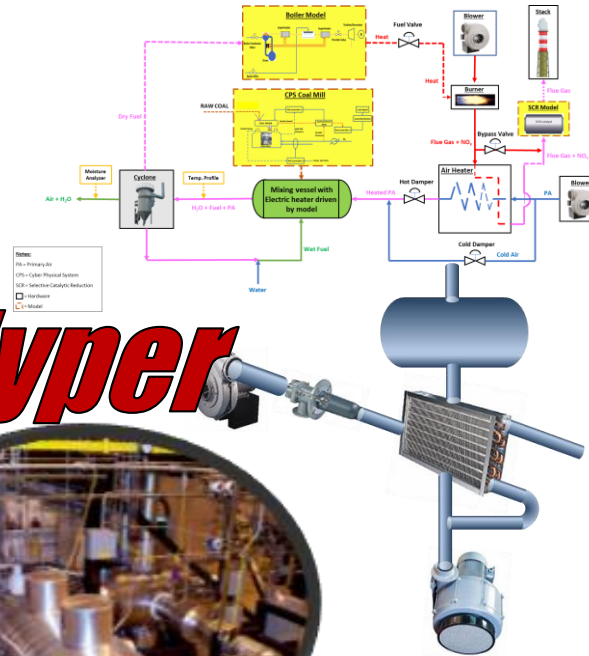
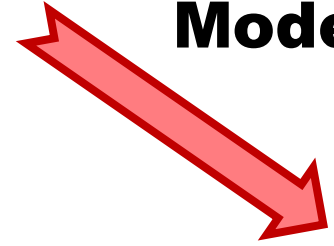


<p>Length s, d, x, y, z</p> <p>Speed $v = \frac{d}{dt} = \frac{x}{t} = \frac{\Delta x}{\Delta t}$ $v = \frac{dx}{dt}$</p> <p>Acceleration $a = \frac{\Delta v}{\Delta t} = \frac{dv}{dt} = \frac{d^2x}{dt^2}$</p> <p>Kinematic Equations (1) $x = x_0 + v_0t + \frac{1}{2}at^2$ (2) $v = v_0 + at$ (3) $a = \text{const.}$ (4) $v^2 = v_0^2 + 2a(x - x_0)$</p>	<p>$C = 2\pi r$ $s = \theta r$</p> <p>$\theta = \frac{s}{r}$</p> <p>$\omega = \frac{v}{r}$</p> <p>$\alpha = \frac{a}{r}$</p>	<p>Angle θ (radians) = (rad)</p> <p>Angular Velocity $\omega = \frac{\Delta \theta}{\Delta t}$ (rad / sec) $\omega = \frac{d\theta}{dt}$</p> <p>Angular Acceleration $\alpha = \frac{\Delta \omega}{\Delta t} = \frac{d\omega}{dt} = \frac{d^2\theta}{dt^2}$ (rad / sec²)</p> <p>Kinematic Equations (1) $\theta = \theta_0 + \omega_0t + \frac{1}{2}\alpha t^2$ (2) $\omega = \omega_0 + \alpha t$ (3) $\alpha = \text{const.}$ (4) $\omega^2 = \omega_0^2 + 2\alpha(\theta - \theta_0)$</p>
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IDAES
Institute for the Design of
Advanced Energy Systems

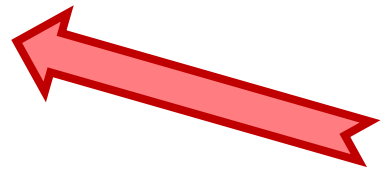
**Numeric
Models**



**Cyber-Physical
Models**

Hyper

**Pilot Plants
(Physical Models)**



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