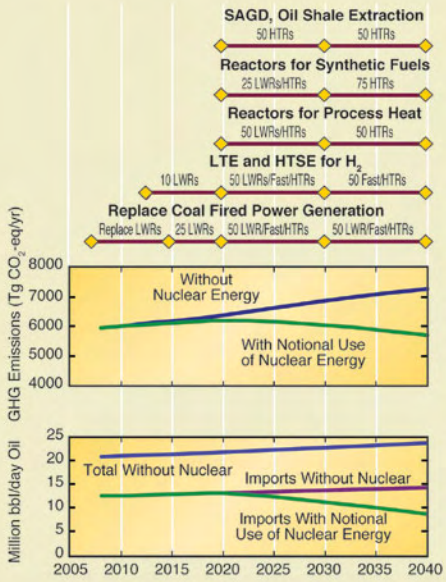
Theoretical Example of Nuclear Assisted Energy Production



U.S. Benefits with Nuclear Energy Integration:

- > 20% reduction in GHG emissions
- > 15% reduction in fossil fuels use
- > 30% reduction in imported crude
- > 5-15% reduction in fuel cost

Nuclear Hybrid Energy Systems – An Emerging Paradigm

- Increasing cost of energy provides impetus to implement energy efficiency and energy resource conservation
- As carbon emissions are tied to climate change, federal regulations are likely to favor clean energy production and manufacturing
- Domestic energy production will lead to greater national security and economic prosperity by investing in domestic projects
- Expanded use of nuclear energy will supply clean electrical power, process heat, hydrogen, and oxygen for industry applications

Expanded Use of Nuclear Energy

Nuclear-assisted hybrid energy used in industrial applications achieves resource security, environmental sustainability, and economic stability through system optimization.

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08-GA50599

Nuclear-Industry Energy Application Examples

U.S. Industry Currently Depends on Inexpensive Fossil Energy.

Major Industrial Energy Users

- Transportation fuels production and refining
- Petro-Chemical
- Agriculture
- Mining
- Steel, Glass, and Cement
- Paper Products

Fossil fuel consumption is linked to greenhouse gas emissions resulting in climate change

- Thermal resource extraction and electrically powered mining operations
- Coal, oil, biomass, and waste feedstock preparation and conversion
- Replacement of fossil fuels for process heating
- Synthetic fuels (CTL and BTL)
- Clean hydrogen for product upgrading, fertilizer production, metals and glass manufacturing, etc.
- Clean oxygen for feedstock gasification, oxy-combustion, basic metals refining, etc.
- CO_2 recycle and reuse

Implementation Schedule

Near Term (~5 years): LWR

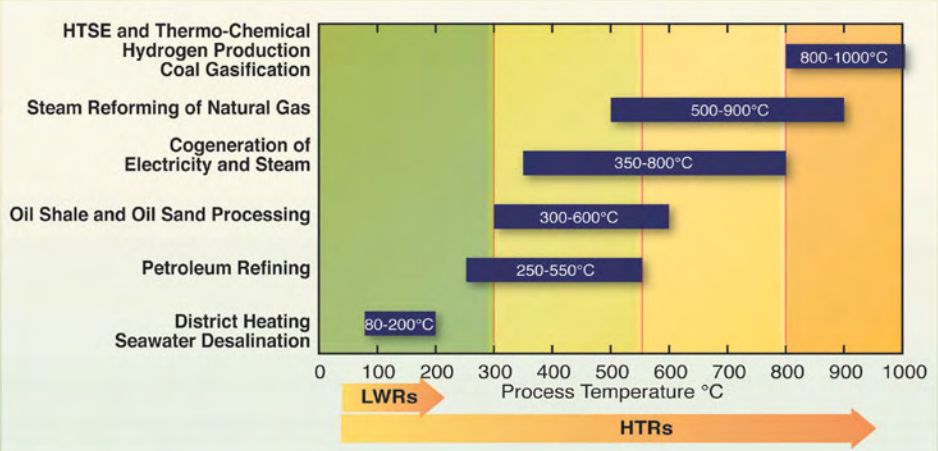
- Clean electricity, LTE, water treatment

Intermediate (~10–15 years): HTR

- Cogeneration of electricity and steam for intermediate process heat applications, HTSE, SAGD

Long Term (~15–20 years): Advanced HTR

- High temperature process heat for wider applications, SMR, in-situ oil shale production, HTSE and co-electrolysis of CO_2



Acronyms

NGNP	New Generation Nuclear Plant	LWR	Light Water Reactor
Fast	Fast Neutron Reactor	HTR	High Temperature Reactor
SMR	Steam Methane Reforming	SAGD	Steam Assisted Gravity Drainage
LTE	Low Temperature Electrolysis	HTSE	High Temperature Steam Electrolysis
BTL	Biomass to liquids	CTL	Coal to liquids