



Moving Forward with Homegrown Energy

Energy Systems

If we are going to reap the potential economic, environmental, and energy security benefits that are the promise of renewable energy, integrated energy systems must be developed.



Renewable Energy Systems

- Production Systems
- Economic Systems
- Conservation





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Electricity





Peak demand
electricity

Hydrogen





Peak demand
electricity

Hydrogen



NH_3



Peak demand
electricity

Hydrogen



NH_3

Transportation
fuels



Other products

Peak demand electricity

Hydrogen



NH_3

Transportation fuels



Other products

Peak demand electricity

Hydrogen



biomass

NH_3

Transportation fuels

biofuels



Other products

Peak demand electricity

Gasification

biomass

Hydrogen



biofuels

NH_3

Transportation fuels



Other products

Peak demand electricity

Gasification

Hydrogen



biomass

biofuels

NH_3

Transportation fuels

Dispatchable power



Other products

Peak demand electricity

Gasification

Hydrogen

biomass

Bio-refining



biofuels

NH_3

Transportation fuels

Dispatchable power

Conservation Systems

Ultimately, we not only need to develop robust, dependable, and efficient renewable energy production systems to meet a growing global energy demand, we need to use less energy and have less impact on our environment.



Renewable Energy Systems

- Being safe or being good?
- Safe
 - Comfort
 - Growing global demand
 - Political stability
 - Environmental stability





Thank you

<http://wcroc.coafes.umn.edu>

