

## **Technology Roadmap Overview**

The Technology Roadmap is a compilation of feedback from our commercial and defense-sector partners. It identifies advanced materials and nanotechnology focus areas and their applications, which industry and the department of defense have identified as promising for commercialization. The Roadmap serves as a template to guide potential submitters of ideas and proposals to the Center for evaluation.

As of October 2009, the Technical Advisory Committee (TAC) of the PA Nano Center has revised the Technology Roadmap. These revisions recognize the importance of nanomaterials in enabling a broad range of new energy related products and processes. To reflect this need, the Center has added and updated a new section of the Roadmap to address Energy.

In addition, other areas of the Roadmap have been updated to reflect the latest needs in the marketplace, as suggested by the TAC. All potential proposers to the Center should review the changes to the Roadmap to ascertain whether their suggested projects meet one of the technology areas of interest to the Center.

Pennsylvania  
Nanomaterials  
Commercialization  
Center  
Technology  
Roadmap Overview



Passive Functional  
Materials

- Organic Coatings
- Inorganic Coatings
- Films
- Biofilms

Energy

- Energy Generation
- Energy Conversion
- Energy Utilization
- Energy Storage

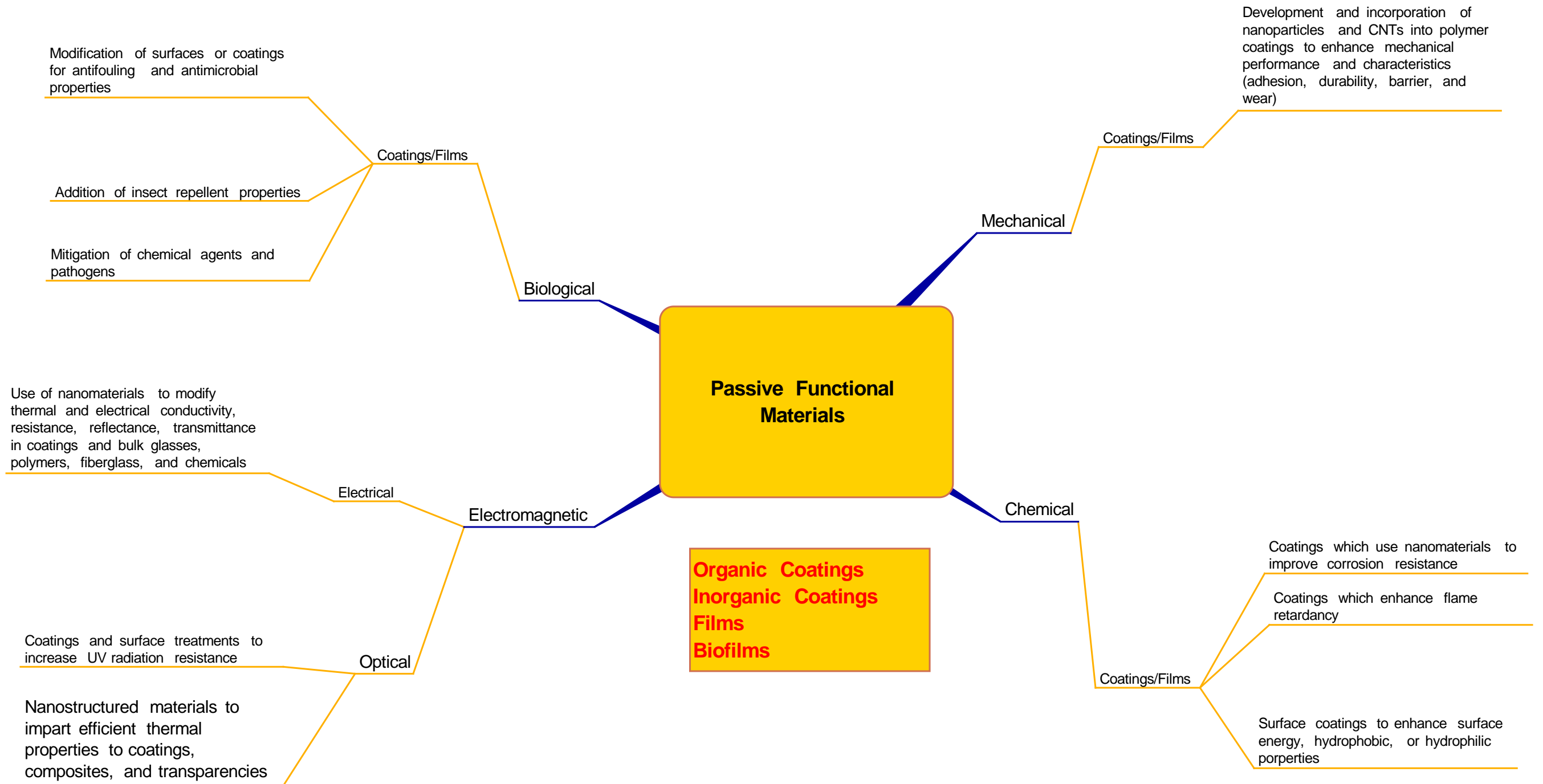
Materials that have or  
include:  
Nanostructure  
Nanodimensions  
Nanoparticles

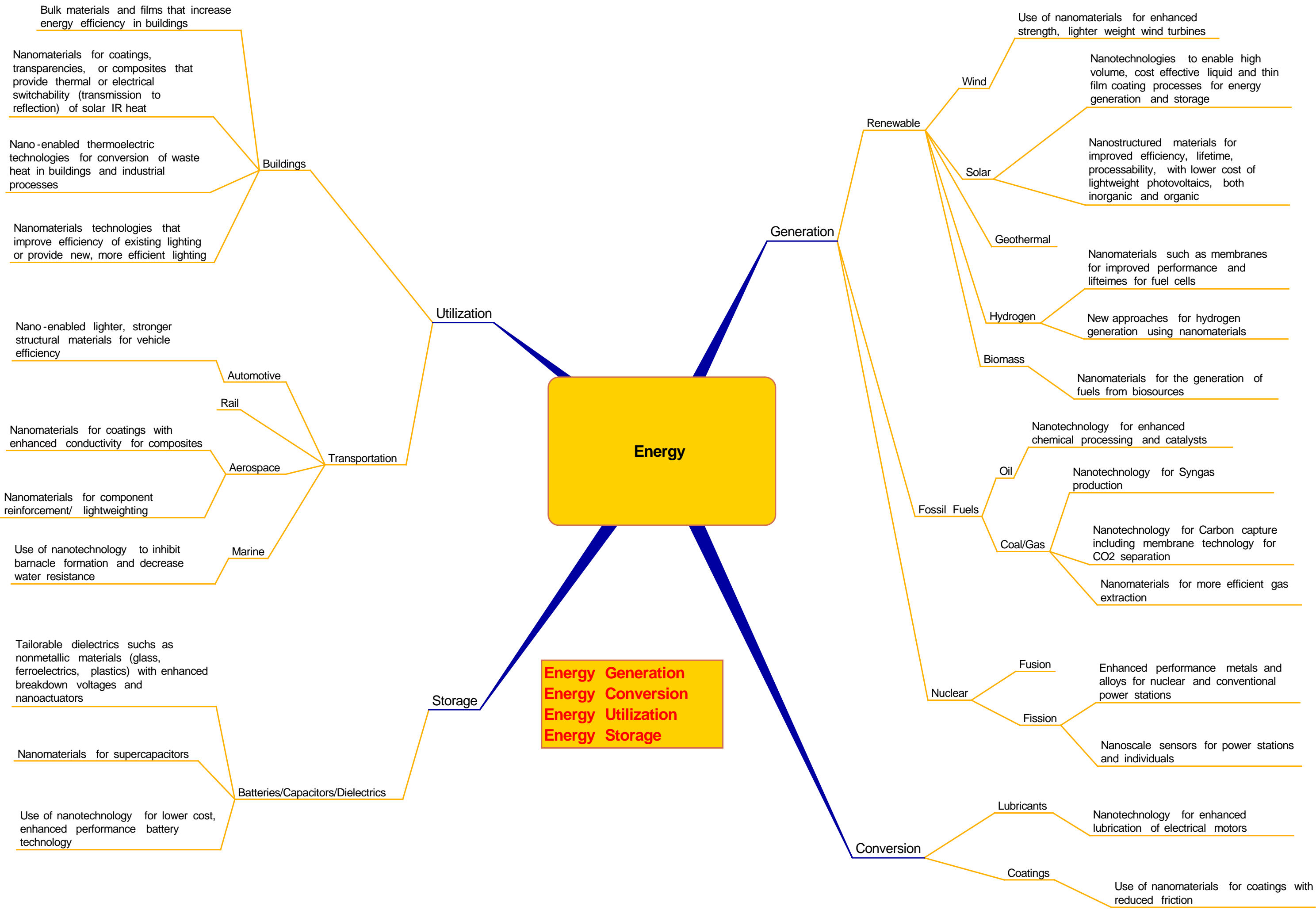
New/Enhanced Structural  
Materials

- Metals
- Alloys
- Ceramics
- Bulk Polymers
- Laminates
- Composites

Active Functional  
Materials

- Sensors
- Adaptive Materials
- Enhanced Biomaterials





**Energy**

**Energy Generation  
Energy Conversion  
Energy Utilization  
Energy Storage**

**Utilization**

**Buildings**

Bulk materials and films that increase energy efficiency in buildings

Nanomaterials for coatings, transparencies, or composites that provide thermal or electrical switchability (transmission to reflection) of solar IR heat

Nano-enabled thermoelectric technologies for conversion of waste heat in buildings and industrial processes

Nanomaterials technologies that improve efficiency of existing lighting or provide new, more efficient lighting

**Automotive**

Nano-enabled lighter, stronger structural materials for vehicle efficiency

**Rail**

Nanomaterials for coatings with enhanced conductivity for composites

**Aerospace**

Nanomaterials for component reinforcement/ lightweighting

**Marine**

Use of nanotechnology to inhibit barnacle formation and decrease water resistance

**Batteries/Capacitors/Dielectrics**

Tailorable dielectrics such as nonmetallic materials (glass, ferroelectrics, plastics) with enhanced breakdown voltages and nanoactuators

Nanomaterials for supercapacitors

Use of nanotechnology for lower cost, enhanced performance battery technology

**Generation**

**Renewable**

**Wind**

Use of nanomaterials for enhanced strength, lighter weight wind turbines

**Solar**

Nanotechnologies to enable high volume, cost effective liquid and thin film coating processes for energy generation and storage

**Geothermal**

Nanostructured materials for improved efficiency, lifetime, processability, with lower cost of lightweight photovoltaics, both inorganic and organic

**Hydrogen**

Nanomaterials such as membranes for improved performance and lifetimes for fuel cells

New approaches for hydrogen generation using nanomaterials

**Biomass**

Nanomaterials for the generation of fuels from biosources

**Fossil Fuels**

**Oil**

Nanotechnology for enhanced chemical processing and catalysts

Nanotechnology for Syngas production

**Coal/Gas**

Nanotechnology for Carbon capture including membrane technology for CO2 separation

Nanomaterials for more efficient gas extraction

**Nuclear**

**Fusion**

Enhanced performance metals and alloys for nuclear and conventional power stations

**Fission**

Nanoscale sensors for power stations and individuals

**Conversion**

**Lubricants**

Nanotechnology for enhanced lubrication of electrical motors

**Coatings**

Use of nanomaterials for coatings with reduced friction

