Biofuels and the Energy-Water-Environment Nexus Break out Group

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Focus areas:
Process: see questions 1, 4, 2, 7, 11, 6, 12
Water, Waste, Sustainability: see questions 5, 3, 9, 10, 8, 12
Scaling of integrated multifuel network energy

Preliminary Questions for White Paper Development

1. Process development to maximize lipid production while minimum energy and water use.
2. How can bio systems be improved for bio energy production?
3. What biofuel source makes most sustainable (land, water) by products in addition to energy?
4. How do we provide solutions for water, nutrients, and $CO_{2\ for}$ sustainable algal-bio fuels?
5. How to control and minimize the effects of bio waste on environment (air, water, soil)? Which technology converts waste into bioenergy?
6. What is the efficient way to extract and convert agal biomass to biofuels and co-product?
7. Monitoring chemical composition of algal feedstock and to produce fuel.
8. What are technical regulatory and resource constraints to scaling-up algal agronomy?
9. Evaluate different biofuels, algae, range, ag, forestry, carbon dioxide flux, water use of yield, environment with direct or indirect benefits workforce develop.
10. Agriculture/forest/range lands potential for generating biofuels; understand and quantify water and energy components involved.
11. Productivity and stability of algae monoculture vs polyculture
12. Water sources for algae and implications for feedstock quality
13. Relationship between scale and economics of pro and by-pro

Geothermal Break and the Energy-Water-Environment Nexus out Group
Lead Writer: Mark Person NMT
Writers: Laura Crossey UNM, John Wilson NMT, Janie Chermak UNM, Karl Karlstron UNM, Caiti Steele NMSU

1. New Mexico mostly low temperatures (less the 80 degrees) geothermal resources. How can these resources be best used from an economic and technical perspective? Are there synergies with other renewables such as bio algae?
2. Cation and silica base geothermometers frequently over estimate deep reservoir temperatures. Can we develop a new geothermometer for low temperature New Mexico's systems?
3. How does the geologic framework of New Mexico geothermal systems impact production, resource evaluation, and aquifer vulnerability? What are the legal implications for geothermal water development?
4. Are there synergies between brackish water development or carbon dioxide sequestration with low temperature geothermal?

Solar and and the Energy-Water-Environment Nexus Breakout Group
Lead: Caiti Steele NMSU
Writers: Ken Boykin NMSU
Others to invite: Olga Lavrova UNM

10. How can energy solar driven processes; photochem be used to promote sustainable clean energy?
11. Where are optimal locations for solar panel installation? (in state) + (US)
12. What are the impacts of under development on water resources? (future)
13. How can New Mexico science contribute to U. extraction processing? Dealing with legacy?
14. What is the environmental and socioeconomic legacy of U. mining?
15. How can we use dairy wastewater for energy and fertilizer development?
16. What is the impact of rural local solar PV/thermal use on water resources eg. higher transmission cost of line power vs on site PV generation, including ecosystem function in the wild land urban interface.
17. How can solar energy be used for carbon dioxide mitigation?
18. How can we exploit New Mexico's solar potential and support US-made solar panels
19. How much and how quickly can wind and solar energy production reduce need for coal generated electricity and its use of water?
20. Is there a strong role for solar ponds for energy production? How can this technology be optimized to also minimize impacts of water and environments?

Photochemistry and the Energy-Water-Environment Nexus Breakout Group
Michael Haegy NMT
Others: Plamen Atimasov UNM; Aaron Collins SNL

1. How can oil and gas produced water be turned into an economic resource instead of a waste management issue?
2. The state of produced water from oil and gas production impacts of resources and the environment but is poorly understood. What fundamental and applied research is needed to address this gap?
3. What is the most robust and efficient water treatment process for recycling produced water?
4. Is it possible to clean up produced water for other uses in an economically feasible way?
5. Will water issues constrain oil and gas development?

Water and Gas and the Energy-Water-Environment Nexus Breakout Group
Lead: Jan Hendrickx NMT
Writers: Frank Huang NMT, Laura Crossey UNM, Bruce Thompson UNM
Others to invite: Robert Balch NMT, PRRC

1. Change in water supply from surface ground water, does this mean more dependence on sustainable energy sources (eg wind/solar)?
2. How can New Mexico become more robust against climate change by optimally combining ragland management for cattle production and energy generation (eg solar)?
3. How can low-heated micro hydropower be produced for energy in ag irritation systems?
4. How can the impacts of modern hydrofracting be initiated?

Socioeconomics and Overarching Questions and the Energy-Water-Environment Nexus Breakout Group
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1. Socio ecological landscape resilience to interactions of water as resource for consequences, local energy production
2. What are the energy costs and environmental impacts of extracting transporting, provisioning and treating water in New Mexico?
3. How can we monitor estimate and/or model the impact of energy production of water availability quality?
4. How to promote information flow across New Mexico communities to facilitate environmental monitoring optimal energy usage under constraints climate change predictions for New Mexico and collaborative research for the above?

5. What are the characteristics of a scientific CI?
6. What are the economic and ecological impacts of technological transitions in energy, conservation, and waste?
7. In the face of increasing resources scarcity and climate change how do we create energy and water sufficiency with social and environmental health?
8. Strategies to mitigate the impact of climate change induced water shortage.
9. What WEE policy measures can be taken to reduce economic and environment vulnerabilities to climate change?
10. What are the sustainable alternatives for New Mexico communities as energy and water resources are exploited in a climate-changing world when the physical and social science are considered simultaneously and with feedback?
11. What full life cycle implications of energy extraction processing production on environment, water economy and how does life cycle evolve with climate change?
12. What new sensing technologies should be developed to better monitor resources availability, usage, and quality?
13. How can the public ensure efficient progress sound policies. Re: WEE measures are enacted?
14. How do we evaluate policies?