

Sustainable Technologies Roundtable Summary

Coalition of Sustainable Communities NM & Creative Santa Fe

Monday, April 22, 2019

Roundtable Objective: To explore how to leverage our extraordinary applied research assets and policy through leadership into new partnerships to develop sustainability solutions that address our challenges.

New Mexico should be a natural leader in sustainability and climate change action: New Mexico has one of the highest renewable portfolio goals (really, *non-carbon*) in the nation, a legislature and administration that have raised the profile of climate action and sustainability.

The event covered a discussion of the possibility of developing a consortium in NM to address practical solutions to our climate problems - not only focusing on high-tech, but also looking at low-tech innovation ideas as well as changes in business and household practices, and policies.

In Attendance:

1. Akhil, Abbas | Energy Consultant & House District 20 State Representative
2. Beloff, Beth | Executive Director, Coalition of Sustainable Communities NM
3. Borchert, Claudia | Sustainability Manager, Santa Fe County
4. Breecker, David | Managing Director, Microgrid Systems Laboratory
5. Castillo, Tim | Associate Dean of Student Engagement + Academic Innovation, UNM School of Architecture + Planning
6. Christodoulou, Christos | Dean, UNM School of Engineering
7. Conn, Cyndi | Executive Director, Creative Santa Fe
8. Crawford-Garrett, Bryan | Food and Agriculture Policy Officer, Thornburg Foundation
9. Gomez, Stephen | Full-Time Faculty at SFCC School of Trades, Advanced Technologies and Sustainability
10. Gonzales, Javier | Strategic Advisor States and Local Government Market, Descartes Labs, Former Santa Fe Mayor
11. Gutzler, David | Professor, Earth & Planetary Sciences Dept., UNM
12. Hightower, Michael | Research Professor, Civil, Construction and Environmental Engineering, UNM, and Vice President, New Mexico Desalination Ass. (NM Desal)
13. Hultin, Paul | Attorney, Environmental Law, Art Law, Public Policy Advocacy
14. Johnston, Mariann | Project Manager, Feynman Center for Innovation, Los Alamos National Labs
15. Kipnis, Bill | Senior Business Development Manager, Siemens Building Performance & Sustainability Division
16. Mang, Bob | Board Member, Santa Fe Green Chamber of Commerce
17. Mazzaro, Laura | Applied Scientist Specialist, Descartes Lab
18. Mooiweer, Henk | Managing Member Soil Value Exchange, Adjunct Professor of Invention and Innovation, Rice University

19. Roy, Pam | Executive Director, Santa Fe Food and Ag Policy Council
20. Sells, Rene | Partnership Development, Sandia National Laboratories
21. Spangenberg, Luke | Director, SFCC Innovation Center and Biofuels Centers of Excellence
22. Stansbury, Melanie | Sustainability Consultant & NM District 28 Representative
23. Talbot-Zorn, Justin | Senior Adviser, Center for Economic and Policy Research

Roundtable Summary: Overall, the group supported the idea of a consortium being developed in New Mexico to focus on applied sustainable technology research and development, leading to the development of practical solutions and creation of businesses addressing climate grand challenges for New Mexico. The group was interested in defining who would be the best partners, desired end-states, goals and vision, which are the most pressing challenges to address and addressing them in a holistic way, the short- and long-term frameworks, and the logistics and formats that could promote action on those subjects in the near future, including organizational structure, new policies, financing mechanisms, and first pilot project. There was consensus on the need for *strong leadership* to mobilize ideas across sectors, institutions, and disciplines.

New Mexico challenges were summarized: 1) Lack of modernized policies and laws regarding natural resource management in New Mexico; 2) Research organizations (including universities and national labs) are not integrated together; 3) Aligning institutional funding in the state with investments; 4) Leveraging federal funding with state funding; 5) Need to improve cross-sectoral interactions; 6) Breaking down governmental silos; 7) Basic science is covered in our research institutions but not integrated well or producing translational tools useful for decision-making; 8) Institutional cultures within our science and technology organizations incentivize a focus on innovative, cutting-edge work and publishing instead of answering the more pragmatic challenges related to New Mexico; 9) No institutional and financial resources to support our workforce, making it difficult to retain our workers to solve local problems.

Start by simply convening the right people to take inventory of our assets and figure out how to overcome barriers and work together to address our grand challenges -- particularly on climate, soil and water. We can learn from other successful consortium projects like HARC (Houston Advanced Research Center) and Innovation Lab at SFCC. Initiating an Innovation Tournament or a statewide RFP focusing on a grand climate challenge requiring response by collaborative teams will move this idea forward the fastest.

SUMMARY – GREEN TEAM

- Need for strong leadership in the state to mobilize ideas across sectors, institutions, and disciplines and to bring people together
- Assessment: What are the biggest challenges for US + NM: in NM methane is significant; soil capture of carbon is low hanging fruit to drive down carbon and assist economic development in ag and ranching; water reuse and desalination...
- Need for a roadmap: where to start? What is our vision? Where do we want to be in 5 years and long term with any of the ideas?
- Identify financial resources to address these concerns
- Develop policies that drive toward the end goals
- Where to start? Pick one or two good idea: Water and soil innovations are interconnected; methane mitigation; increased clean water availability
- How do we keep this conversation going, and what kind of structure do we want to use to convene more of these dialogues, to move from ideation to piloting and finally to implementation?

- Consider either utilizing an existing 501C3 or creating one to coordinate future discussions, action plans and project management.
- Consensus on important goals and vision, short and long term.
- Consensus about target challenges (carbon sequestration, recirculating water).
- Collect data
- Convene experts on specific questions, identify the best practices, bring together a group of people to learn about a viable policy opportunity. Consensus building on specific topics.
- Seek Federal and State Funding, as well as private financial interests, to support a state sponsored RFP around a grand challenge; then have inter-institutional, interdisciplinary and cross-sector teams compete.
- Develop a pilot - proof of concept

SUMMARY – RED TEAM

- Four functional areas that we need to address:
 - Needs assessment - what are the big questions?
 - Addressing the policy conditions & align funding
 - Data & modelling systems
 - Sustainable business model, deployment and education
- Break down silos
- Need for leadership
- Where do we start? Small proof of concept
- What does “modernizing policy” mean?
- SFCC innovation lab
- How other orgs have brought groups together to do a needs assessment

SUMMARY - OTHER CONSORTIUM MODELS TO EXPLORE: The following were mentioned:

- HARC (Houston Advanced Research Center) - focused on application of science on sustainability issues
- Microgrid Systems Laboratory - developing in NM through SFCC
- Innovation Lab at SFCC
- Innovations-in-Place
- Innovation Tournament, an SBIR Program
- National Council for Science and the Environment collaborative science policy governance model

Overview Panelists: Six panelists (David Gutzler, Mike Hightower, Abbas Akhil, Hank Mooiweer, Justin Talbot-Zorn, and Melanie Stansbury) kicked off the session and provided guidance and a framework for the broader discussion regarding the development of an innovation consortium:

The imperative for sustainable innovation: Climate Change and its impacts on New Mexico.

- Climate of the Southwest is changing very rapidly. Temperatures are about 3 to 3 1/2 Celsius warmer than they were just half a century ago.
- Already having impacts on water resources, resource management (fire activity), trend toward aridity affecting water resources, stream flow set low records due to rising temperatures.

- Warmer in terms of heating degree days in Albuquerque this winter than the average was in the late 20th century.
- We need to adapt our existing built environment and resource management policies to the ongoing change.
- There is a global movement to mitigate greenhouse gas emissions, but we can't say emissions are going down and that's part of the problem. In NM we have a choice: whether we want to get ahead of the trend of mitigating greenhouse gas emissions and take advantage of the global impetus to reduce emissions or whether we want to fall behind.
- We have no choice but to be a lot smarter about the way we manage water and resources.
- In a discussion about sustainability we need to have some serious thought framed around the question of what it is that we're trying to sustain. My personal opinion is that adding or obtaining incremental amounts of water will not solve our water resources challenges that we need to think about whose water that will be, how we're going to manage it, and what we can do in a way that is equitable across the state.
- We're faced with 19th century water law, 20th century water infrastructure, and 21st century climate - how we deal with all those factors together is an incredibly challenging topic by itself.

Background on water challenges and opportunities.

- If you look at sustainability from a resources standpoint that includes food, water, climate and energy, plus the economic and social resources - we need to look at the whole system. We're trying to optimize this multi-parameter problem. We cannot just look at CO2 or water. Need a holistic approach.
- We're looking at an arid cycle that is going to be 300 years long - we have more than a century or more of predominantly more arid climate issues. These are and have been real stresses to civilizations in the past. We're looking at 70% reduction in rainfall since the 1700s.
- We're already stressed in our fresh water supplies and it's going to be even worse. We have to look at alternative water resources (desalinization), especially of the large reserves of brackish water.
- There's a lot of water innovation happening in this region of the country already that we can draw on - the city of ABQ has a 100 year sustainable water plan, using surface water to support ground water so they're not mining the aquifer, whose levels are rising in the middle Rio Grande ; El Paso has the largest inland brackish groundwater desalination facility in the world to support their sustainability; we have both a new brackish water treatment plant, and a national brackish water treatment research center in Alamogordo that could help lead regional efforts in creating new fresh water supplies from desalination.

Background on renewable energy challenges and opportunities.

- Goal of being carbon free by 2045 - what is the path to get there? Is it feasible? What infrastructure do we need? What's the role of PNM? Is it sustainable and affordable?
- The most underlying problem for us is that most of our transmission infrastructure lies west of the Rio Grande and yet all our resources in renewables are in the east side, along the border with Texas.
- Oil and gas extraction and refining provide 25% of our state's revenue. If we move to a future that is 100% renewable, there are a few things that are misconceived: the oil and gas industry mistakenly feel that their existence is threatened - the oil that is extracted

from our ground is not used for electricity generation, it is used mostly for transportation and for export outside the state. We do use a little bit of natural gas for generation of electricity, but it's a small fraction compared to the overall consumption.

- How do we supplement our state revenues from renewable generation and renewable industries? The income to the state that is generated from renewable industries is not tracked by the Tax and Revenue Department - that needs to change. We need to transform our economy to include renewable energy drivers.

Carbon sequestration in the soil as an emerging climate solution.

- Soil can store massive amounts of carbon: The first three feet of soil contains more carbon than all biomass and all atmospheric carbon dioxide. What if you could increase that a tiny little bit, 1%? Our grasslands and prairie lands have the capability of storing more than 25% of all our greenhouse gas emissions, without any land change, you only have to change how you manage your lands. Make it much easier for farmers and ranchers to make that transition - to start working with nature and start managing their lands for soil. In 1-2 years, one could see huge impacts. Healthy soils will store a massive amount of water and become drought resilient.
- Innovation barriers are continually blocking us to make any progress: The more out-of-the-box ideas are the harder it is for people to implement them. Stages: 1) Invention, 2) Innovation, 3) Deployment. You need to reach a proof of concept for each stage before people start investing in this. A \$3.6m investment could be a significant start.
- How Santa Fe and a sustainability facility could eliminate those barriers and bring us to the forefront of what we should do: What if this consortium is focused on removing barriers for invention, innovation and deployment? Select projects based on impact on sustainability for Santa Fe.
- Santa Fe could be carbon neutral in 7 years if 25% of our CO₂ are stored in soils by farmers and ranchers.

Leveraging federal R&D investments toward practical environmental problem-solving, workforce training, and job-creation.

- What's happening at the federal level? The US invests more than \$140 billion annually in federal R&D, which is the most in the world. We have over \$100 billion deficit when it comes to advanced technology products.
- The US doesn't provide the kinds of law & guarantees, education, workforce training, investments in the industrial economies that like other countries.
- Other countries our coming and picking our winners - taking good ideas that are coming from our national labs and our universities and anchoring the production of those new technologies overseas.
- National Manufacturing/Innovation Foundation: Working with senate offices - how to do this kind of translational research.
- NM can try new innovations, empowering academics and national labs into generating commercial endeavors that stay in NM and create meaningful jobs here.

Policy progress in NM on climate solutions; national interest in developing practical sustainability solutions; challenges and opportunities for the NM consortium from a policy perspective.

- How do we take science and information and translate that into useful tools and technologies, as well as make sure those are actually applied in decision making and execution.

- Though we spend millions of dollars at the federal level on R&D, only less than 1% is on energy and environment. We spend a micro-fraction of that on earth sciences. Most of our federal R&D is spent on aerospace, defense and health.
- NM challenges are around mitigation - how do we keep carbon from getting into the atmosphere or take it back out.
- To be able to respond to climate change you need to have the data and information to understand how it's going to impact a specific place.
- Reconnect science back to policy and to communities (people who have to apply that knowledge).
- NM Opportunities: Abundant in natural resources (sun, wind, landscapes), culture and resilience (lived here for hundreds of years), scientific resources (research institutions, labs, universities, and private organizations). Opportunities in the political side: science & technology people serving in legislature and new mindset ripe for change. We have wealth in our state, but it invests elsewhere (ie SIC, State Investment Council).
- NM Challenges: 1) Lack of modernized policy regarding natural resource management and laws in NM. 2) Research organizations are not integrated together. 3) Aligning institutional funding in the state with investments. 4) Improve cross-sectoral interactions. 5) We have great research institutions, basic science covered, but not integrated well and lack of translation into tools useful for decision-making. 6) The institutional cultures within our organizations, in particular in science and technology, where the incentive is to do innovative, cutting-edge work and to get published instead of answering the more pragmatic questions of what would be best for NM. 7) No institutional and financial resources to support our workforce; we cannot, therefore, retain our workers to solve problems here at home.

Comments from group:

- Education is the KEY. It is not emphasized enough. Peace engineering.
- We need to organize around big ideas, big challenges: grid expansion and modernization; carbon sequestration in soil; water desal; methane releases..... overlay education on these big ideas.
- Bring oil/gas and IOUs to the table. They present obstacles/opportunities to moving forward with innovations. Include them in follow-up meetings.
- Give scientists in the state business education to create practical business mindsets.
- Some progressive bills were passed: RPS in the ETA, Water Data Bill, Healthy Soils Bill.

MEETING NOTES:

GREEN GROUP BREAKOUT

Group Attendees: Abbas Akhil, Beth Beloff, Christos Christodoulou, Bryan Crawford-Garrett, Bob Mang, Laura Mazzaro, Henk Mooiweer, Rene Sells, Luke Spangenberg, Justin Talbot-Zorn, Claudia Borchert

Beth Beloff reviewed the challenges and opportunities that were outlined in the Roundtable Agenda. The group started addressing challenges first, identifying challenges that were noted in the presentations and the following Q+A, then building towards challenges that are related or not addressed yet.

The following challenges were identified by the small group:

- **Leadership:** There is a need for strong state and local *leadership* to mobilize ideas (“champions”)
- **Modernized Policies:** There are a lack of modernized policies to support sustainable technology development and implementation. There is a need to clearly define the principles of modernized policies that guide our thinking.
- **Integrated, Translational Approaches:**
 - There are many distinct and unmoving institutional silos.
 - Interdisciplinary, interinstitutional, and cross sectoral integration is needed to work toward solutions (for example: small businesses and universities, as well as other organizations that could collaborate to each other’s advantage).
 - Developed science is not being translated effectively into applications.
 - There are barriers preventing developed tools from being applied in the field.
- **Vision and Goals:**
 - There is a lack of specificity in what we are working towards. - A strategic long-term vision is needed.
 - Define what is our desired ecological end-state. What vision can guide this?
 - Set targets that are reachable in 5 years, and in the longer term. Santa Fe can be carbon neutral in 7 years if we focus on carbon capture.
- **Funding:**
 - There are not enough investments from outside of New Mexico, and New Mexico investments are made outside of the state.
 - Institutional funding needs to be reformed in how it is invested. There needs to be more accountability for how the funding is spent. Can the SIC funds be tapped to invest in such a sustainable technology effort?
 - How to go beyond state monies; look to some Federal resources to move ideas forward.
- **Big Challenges:**
 - Methane pollution is a large challenge specific to New Mexico.
 - Community Solar would give every New Mexican access to solar regardless of income or property ownership.

In response to the challenges, the group identified the following opportunities and action items. The conversation focused largely on methods for implementing a consortium to support positive action.

- **Where to Start:**
 - Start building and promoting prototypes and proof-of-concepts for sustainable technologies and implement them in the field. Start with affordable, feasible projects to attract investments and grow the market. Build awareness of the tools.
 - Develop more short-term plans that are aligned with a long-term future plan.
 - Promote and support more start-ups that are working on climate issues.
- **Policies:** Work on developing and supporting policies that use resources responsibly.
- **Funding:** Find methods to reallocate the \$23billion of funding that exists (in the SIC) and around the state towards sustainable technology solutions. Start disrupting the mindset that those funds need to be protected for a ‘rainy day’.
- **Promote more collaboration and interdisciplinary work,** providing opportunities to exchange assets in the field of sustainable technologies.
 - The idea of a state-run RFP was discussed. The basis of the RFP would be collaborative, requiring a state institution to work with a local business to investigate one grand challenge around sustainability answered by applied research. The funding amount would attract competitive proposals. The project

proposal could not be led by a large institution like a national laboratory. Require interdisciplinary, inter-institutional and cross sectoral teams to apply.

- Institutions could start staffing their departments with people who have real-life business skills and experience. Provide opportunities for researchers to learn business principles. This will help in translating science into action.
- Start developing innovation centers at the local level. a good model is the Innovation Lab at the Santa Fe Community College.
- **Who to Include:** Native Americans in the discussion and collaboration; need to engage oil and gas companies in these conversations to affect action and change.
- **Grand challenges being faced in New Mexico:** water, methane, and soil. Work with the state agencies to identify big challenges and enroll their assistance in finding solutions: MNERD, Office of Economic Development, NMED.....
- **Model consortia:**
 - Innovations-in-Place as a model for best practices.
 - Consider Innovation Tournament which is an SBIR Program. It is like the RFP concepts, requiring competition between teams including National Labs, Local businesses, and interdisciplinary academic interests.

Follow Up Questions:

- How can we generate more business that can drive revenue back into sustainable technology research and development, driving a circular economy? Particularly around water.
- How can we promote awareness and implementation of soil technology to preserve water?
- What kind of organizational model could oversee or house a sustainable technology consortium? Could it potentially be housed by a local existing foundation, a new non-profit? Does it need centralized administration, like HARC? It needs to be a place to collaborate and to generate new ideas, as well as to develop a focus around a few key ideas and attract financial resources to support their development.
- How can we bring oil and gas companies into these conversations at an early stage?

Process Path Forward:

- Form a consensus on important goals and vision - short and long term
- Focus on a *few* ideas: Soil CO2 sequestration, recirculating water, methane mitigation, community solar
- Identify best practices
- Convene experts - cross-sectoral and interdisciplinary
- Work on Federal and state grants to support, state RFP, Bring in public and private financial interests
- Identify areas of consensus
- Educate the group with research and development briefs
- Get everyone to work together
- Develop a pilot - proof of concept

Overall, the group supported the idea of a consortium being developed in New Mexico to focus on applied sustainable technology research and development. The group was interested in defining desired end states, goals and vision, which problems to address in a holistic way, the short- and long-term frameworks, and the logistics and formats that could promote action on those subjects in the near future.

RED GROUP BREAKOUT

Group Attendees: David Breecker, Cyndi Conn, Stephen Gomez, Javier Gonzales, Michael Hightower, Paul Hultin, Mariann Johnston, Bill Kipnis, Pam Roy, Melanie Stansbury, Tim Castillo.

Melanie started the session by reminding the group about the goal of identifying some of the structural challenges and opportunities for building a consortium around the issues of energy and the environment in New Mexico, with the intended outcome of taking this information and seeing if there's an opportunity to build something. They started by looking at the questions listed in the agenda.

1. What has been tried in the past? What currently exists? What can we learn?

KEY: We need leadership and a good idea to get something done.

The solutions that come up must be compatible with our rural communities

Examples of Collaborations that have worked:

Microgrid Systems Laboratory (MSL) Founded in 2006 in collaboration with Siemens .

- **4 major programs:** Research, innovation, demonstration, education.
- **Current Partners:** Los Alamos National Laboratory, Sandia National Laboratories, The National Renewable Energy Laboratory, Duke Energy, the Center for Emerging Energy Technologies at UNM, HOMER Energy, SteamaCo (Kenya), the Clean Coalition, the Advanced Energy Centre at the MaRS Discovery District (Canada), Los Alamos Department of Public Utilities, The Energy and Resources Institute (India), General MicroGrids, Modern Grid Solutions, and the Smart Cities Council.
- **Key** is that it is a teaching collaboration that combines with a strong business side. Educational component is split into two parts: academic research and workforce. Workforce is absolutely critical. Santa Fe as a place to train, a newer idea, Siemens with the manufacturing of the equipment. Natural way to improve the commercialization of their product
- **What made it work?**
 - Critical Components: Research/manufacturing/commercialization/education
 - Siemens – that the school will make money by doing this (Siemens did an audit that demonstrated where the money would be made)
 - Financial incentive – workable business model
 - By collaborating, a lot of time, money and effort were saved
 - Power of two national labs – VETT projects in a public/private collaborative environment

Lab Embedded Entrepreneurship Programs (DOE) The Lab-Embedded Entrepreneurship Programs take top entrepreneurial scientists and engineers and embed them within U.S. national laboratories to perform early-stage research and development (R&D) that may lead to the launch of energy or manufacturing businesses in the future.

- Wells Fargo is funding it locally
- Recruits entrepreneurs from across the nation to work with Labs for high-tech types of problems, to accelerate tech development and build out their business model.
- Sandia and LANL both looking at that.
- Technology readiness legislation: state would invest in those companies ideally – real investment in tech R&D; the state doesn't see that helping rural NM. How does that grow constituencies throughout the state?

2. What are the challenges?

Critical to Focus at the Right Level:

- Focus the agenda on something that interests the scientists
- How do you open up scientists' time to do the applied research?
- Funding from state can help fund the commercialization, manufacturing, business side
- LEVERAGE FEDERAL DOLLARS WITH STATE DOLLARS
- State *never* comes up with the dollars to leverage federal or private dollars

Government Challenges:

- Structural conflicts in the government
- Silos within the state government; agencies don't work together
- Anti-donation clause
- Risk-averse (especially for the Permanent Fund) – need a risk profile to reassess what constitutes a “safe risk” with state funds. What constitutes a “rainy day” need.

Energy + Organizational Challenges:

- Oil and gas should not be excluded. (ie: Shell is a major donor for the Lab Embedded Entrepreneurial Program)
- View across sectors that funding is a zero-sum game: if one energy sector “wins” others loose. We cannot approach the solution in this way – we need to expand the pie so that all can get more

Food + Ag - current successes that could be built upon

- Collaboration, coordination, partnering
- Cross sector collaborations (health, environment, natural resources)
- Bring home federal resources if we match them more directly
- Policy Alignment
- Infrastructure – coordinating across the state of facilities that already exist. Repurposing resources that already exist.
- Connecting to ground/communities
- Internships
- Healthy Soils Act
- Local – Federal – State – Tribal

Water

- No meaningful water legislation due to lack of a state engineer appointee to focus priorities. Any major bill with uncertainty got killed.
- Combine data from all water so each resource is known and smart decisions made about sustainable use.

3. What are the opportunities this consortium might take on?

Need to modernize and update policies.

- Across the board – not just energy (ed, social, etc)
- Invest in Education and economic infrastructure – how rural communities can benefit (fiber, water lines, tech centers)
- State investment council needs to be less conservative and needs to invest in startups and business that has a direct impact, rather than taking money out of the general fund. Invest in NM rather than the stock market.
- Private sector investment
- Change the risk profile for the types of startups that are happening in NM and the type of investment we need (especially for the Permanent Fund)

Make sure we have the right partners and that they invest in the solution.

- NM is good at basic and applied R&D, engineering scale and prototype
- We do not currently assess the market
- Need to better understand the market challenges
- Siemens has \$100M to invest

4. Assess what is the moonshot?

- Assess the need (Macro/Micro)
- Provide data to solve the problems
 - Baseline information to everyone so we are all getting the same information
 - Institutional cultures. Questions at Universities and Labs that can start to solve real issues
 - Tech transfer at the Labs – we need to broaden that into communities, not just businesses
- California has one of the most sophisticated water modeling, but least sophisticated water management
- Maybe the consortium should begin with solving all the legislative problems and providing the data to fix all those problems
- Communities need to be part of the conversation and the work

Specific issues per sector:

Climate

- Resilience
- Physical

Energy

- Grid (e.g. take prisons off grid)
- Resilience

Water

- Water Fracking & Water Conservation - how do you get them to work together?
- That's how we get the oil and gas industry into the conversation
- Desalination & brackish
- [Water Data Bill](#)

Ag/Food

- Water/carbon/resilience
- Traditional ag, water & carbon workforce
- (see notes above)