

**HOPEWELL VALLEY GREEN TEAM**  
**November 14, 2019 at**  
**Hopewell Township Municipal Building**  
**Meeting Minutes**

**In attendance:** Joann H., Margret V., Carol M., Scott F., Rex P., J. Hayton

**ENERGY ISSUES**

~ Andlinger Center for Energy & the Environment Annual Mtg (Rex) - Rex reported on the conference, which he attended. See Rex's full summary at the end of these meeting minutes.

~ Shrink Your Footprint at Home (Joann) - Joann reported on the seminar she attended. Below is a summary of the event, which is the first of four seminars.

*Whether you rent or own, there are things you can do to lighten your home's load on our warming planet. Please join us on Tuesday November 12 at 7:00 PM to learn about building a green planet. Join us on Tuesday November 12 at 7 p.m. to learn about building a greener home, reducing energy usage and encouraging smart buildings within our community. Our panel of industry experts includes: Scott Fischer, Ciel Power, LLC, Heidi Fichtenbaum, Registered Architect and LEED Accredited Professional Kate Warren, Princeton Affordable Housing Board, Forrest Meggers, Princeton University School of Architecture and Andlinger Center for Energy and Environment. The discussion will be moderated by Christine Symington, Program Director at Sustainable Princeton. This program is the first of four seminars focused on practical, actionable, and evidence-based steps to reduce the footprint of our daily lives. Thank you to our generous sponsor NRG Energy, Inc. and our partner Princeton Public Library.*

~ Direct Install Videos RfP (Joann) - Looking for a local business to take part in videos to show as an example of energy reduction.

**COMMUNITY COLLABORATIONS**

~ Diversity in Public GreenSpaces (Joann) - Lisa Wolf heading this thru FoHVOS

~ E-Learning Days (Margret & Joann) - to film videos to be used on snow days for HV schools (3500 students). Central themes of "waste" to reach out to parents *and* students

**REDUCE, REUSE, RECYCLE**

~ Repair Café (Scott) - done in Maplewood successfully. Originally a European idea, staffed by all volunteers. Possible to roll out in a small way for the Green Fest.

~ Styrofoam (Joann, Joe) - a truck has been promised by Pennington Boro for Feb. 1, 2-3 p.m. Need volunteers!! See <https://www.betterframe.org/>.

~ Recycling Updates (Margret, Carol) -- Carol to look into the changes in the textile recycling at the schools.

**OUTREACH (Scott)**

~ Website - Scott is putting in *many* links to local events

~ Facebook (Boosted Posts)

**GRANT IDEAS**

~ Biodiesel Generator (Scott) -- unfortunately, not available in the U.S.

## MISCELLANEOUS

~ Hopewell Township Guide to Leaf Management (Rex) -- Brochure passed out prepared by the Hopewell Township Environmental Commission

~ MCIA coming to towns to talk with community leaders. Joann attending in December.

~ Joann gave a demonstration of the Loop. TerraCycle describes Loop as a circular shopping platform that replaces single-use disposable packaging with durable, reusable packaging. Consumers subscribe and order products that get delivered by UPS in a specially designed shipping tote instead of a box.

~ Pennington Certification -Bronze! -- Congratulations!

## UPCOMING EVENTS

**Nov. 15:** America's Recycle Day

**February 1:** Styrofoam Collection at Tollgate Grammar School 12-3 p.m.

**March 21:** Mercer Green Fest at Rider University 11am – 4pm

First planning meeting: Jan 6 at 6pm

***NEXT HV Green Team Meeting: December 12, 2019 - Hopewell Boro Hall***

**Rex's Report on the Andlinger Center for Energy & the Environment Annual Mtg  
Summary – Annual Meeting Nov 08, 2019  
Andlinger Center for Energy & Environment, Princeton University**

<https://acee.princeton.edu/>

How can we rapidly transition to a decarbonized economy?

What are the roles of government, private enterprise, markets, universities?

What policies and technologies are needed to change to a decarbonized world?

**Phil Sharp, former Congressman & Chair of House Energy & Power Subcomm**

- Baker and Schultz et al. proposed 2017 adoption of carbon tax, instead Trump admin chose to confuse and denigrate science and climate issues.

- But there is progress, e.g. ARPA-E, utility plant coal closures, state & local govt policies, corp's, univ's are cutting CO2 emissions, improving sustainability.

- Much can be un-done by next Admin because laws have not been changed.

- Work toward long-term options, incl carbon capture and nuclear (fission and fusion). Carbon tax is most essential approach needed.

- The GND proposal is a set of ambitions and goals, but “don't let wanting everything stop us from achieving something”.

- Bernie Sanders advocates \$16T (decade) for climate problem, but Fed Govt would own infrastructure, and he's anti-nuclear – so Sharp questions the approach.

- US policy should:

- o Promote competition in energy and sustainability marketplace and enable dynamism of American industry and society.

- o Increase research budget for new energy and engineering.

- o Set long term goals without determining in advance which technologies.
- o Electrify transportation sector, and support fission and fusion.
- o Fund adaptation and resiliency approaches (easily bipartisan).
- We need a “moonshot” inspirationally, but not a good model, need to involve wide cross-section of USA. “Climate Citizenship” needed more than political advocacy; consumer, teaching, research -oriented, we each have a role, time for action.

### **David Babson, Prog Dir, ARPA-E**

ARPA-E (after DARPA) funds high risk/reward new energy research projects.

- Carbon removal industry needs to be built; negative emissions must be scaled up to ~20 GT/yr. For context, US trucking industry emits 9.8 GT/yr CO<sub>2</sub>.
- GG-reducing and land-sparing strategies must be done simultaneously.
- Programs to remove CO<sub>2</sub>, develop uses for captured carbon in economy, e.g.:
  - o ROOTS – Rhizosphere Observations Optimizing Terrestrial Sequestration  
<https://arpa-e.energy.gov/?q=arpa-e-programs/roots>; develop advanced technologies and crop cultivars for 50% increase in soil C accumulation while reducing N<sub>2</sub>O emissions by 50% and increasing water productivity by 25%.
  - o GREET -- Renewable Energy Enabled Carbon Optimized Bioconversion; a carbon-conscious economy is not a low-carbon economy, but rather a renewable “new” carbon economy.
  - o TERRA – Transportation Energy Resources from Renewable Agriculture.

### **Jeff Moeller, Water Research Foundation**

Recovery energy and nutrients from waste water

- Wastewater 80% thermal energy, 20% chemical energy.
  - Recovery: wastewater [energy] + [nutrients] + [pure water] + [chemicals]
- Gregory Nemet, Univ Wisconsin -Madison, School of Public Affairs
- One-half TerraWatt of Solar PV – How We Got Here and Where Do We Go from Here?
- How breakthroughs happen: Einstein, Nobel for photoelectric effect; Bell Labs 1954; Vanguard 1  
<https://www.deepspace.ucsb.edu/outreach/the-space-race/thestory-of-vanguard>; public & private sector applications, big expansion of PV.
  - Role of policy – subsidize new industry early so that it advances to become cheaper so you don’t need to subsidize it any more. “Demand pull”.
  - 50-60 years: US created PV industry, Japan had first “roof-top program”, German massive subsidy program “Germany’s gift to the world”, China today makes cheapest PV panels, “China’s gift to the world - cheap electricity”! (~\$20/MWhr from PV; ~\$3/watt installed PV)
  - Model for new tech for Carbon Capture from air, e.g., Climeworks (Switzerland)  
<https://www.climeworks.com/>. But CO<sub>2</sub> capture must happen 4X faster than solar.
- Audrey Lee, SunRun Energy Services
- #1 solar residential company, 1.7 GW PV installed, 255000 customers (mostly CA).
- In survey by Edison Electric Institute, 51% believe that renewables should constitute 100% of electricity even if it raises the cost of electric bill.

### **David Eaglesham, Breakthrough Energy Ventures**

## How to Decarbonize the World

- Understand the history of how we got here
  - o Robt Bunsen 1855, methane for light and heat;
  - o Abraham Gesner 1865, invented kerosene;
  - o Svante Arrhenius, 1896, physical chemistry revealed how atmospheric CO<sub>2</sub> is responsible for Earth's increasing surface temperature;
  - o Henry Ford, 1909, cheap cars for all;
  - o Fritz Haber, 1909, Haber-Bosch process, CH<sub>4</sub> H<sub>2</sub> NH<sub>3</sub> fertilizer;
  - o Charles Keeling, 55 year CO<sub>2</sub> curve from Mauna Loa, 1990 first IPCC report.
- Outside of electric grid, > 8 GT/yr CO<sub>2</sub> produced in hard to decarbonize sectors.
- Current H<sub>2</sub> market: 110 MT H<sub>2</sub> per year,
  - o ~\$200B industry, ammonia and methane reforming, much in steel industry.
- Need to be able to compete with cost of Haber-Bosch steam methane reforming.
  - o H<sub>2</sub> at <\$2/kg can win the \$200B industry market,
  - o H<sub>2</sub> at <\$1/kg becomes dominant fuel for economy broadly in all sectors.
- Price on CO<sub>2</sub> at ~\$50/T essential, without this it can not happen.
- Pricing (taxing) carbon gets everyone on board with alternatives to fossil fuel in daily/hourly decisions.
- CO<sub>2</sub> tax \$50/T, renewable elec \$10/MWhr, CCUS \$30/T, H<sub>2</sub> \$1/kg

### **Andrew Boscarly, Princeton Univ, Dept of Chemistry**

Carbon Capture and Utilization – turning a pollutant into a product.

- CCUS = Carbon Capture Utilization and Storage.
- Chemical problem, must provide energy to reduce CO<sub>2</sub> to C
  - o CO<sub>2</sub> (60-180 kJ/mol) vs C (400 kJ/mol).
- Cement industry, ~8% of total world CO<sub>2</sub> emission:
  - o ~1 T CO<sub>2</sub> released per T cement;
  - o ~half in chemical process and half in fossil fuel use in production.
- Big market opportunity for CCUS

### **Andrew Boscarly, Princeton Univ, Dept of Chemistry**

#### **Princeton E-Bio Reactor Project**

- Novel approach for CO<sub>2</sub> reduction to C<sub>4</sub> (butanol) and larger compounds useful in the economy and industry.
- Need to start simple, electrochemical conversion CO<sub>2</sub> to formate (HCO<sub>2</sub>)
  - o CO<sub>2</sub> butanol -- 24 electrons, big chemistry challenge
  - o CO<sub>2</sub> formate -- 2 electrons, do-able chemistry
- Princeton E-Bio Reactor project, hybrid electrochemical-biological reactor
  - o reaction vessel with bacteria growing as bio-film on the electrode;
- CO<sub>2</sub> formate has been achieved in the lab!

### **Peter Styring, Chem & Biol Engineering, Univ Sheffield, UK**

Einstein, "The world will not evolve past its current crisis by using the same thinking that created the situation".

- 1 year after UK passed tax (5 p) on single use plastic bags, 95% reduction in use.
- CO<sub>2</sub> Utilization as mitigation tool; use better than storage, find new uses.

- Storage equivalent may be long term or short term depending on the product.
- Flue gas from FF generating plants one of the best places for CO2 capture tech.

**Gay-Wynn Quance, Solid Carbon Products LLC**

**<https://www.solidcarbonproducts.com/>**

Convert CO2 into profitable carbon products

- Noyes process, CO2 + H2 + CH4 solid carbon nanomaterials
- Carbonomics – Noyes process is carbon dioxide negative.
- Profit can drive positive environmental impact.
- C nanomaterial market \$25B (carbon black, high purity C, C fibers, nanofibers).
- Achieving scale (pilot commercial) most difficult stage in creating n