The Responsible Transition to Low Carbon Alternatives & Renewables

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- How to get to a more sustainable situation?
- **Bill Collins**:
- Effect of mankind on greenhouse effect has been demonstrated using data in Oklahoma over 20 years
- Previous models agree with the observations
- Changes in the greenhouse effect are directly linked to fossil fuel emissions
- There is firm evidence that fracking is influencing the greenhouse effect
- The chemicals can be seen in the data sets
- Spikes from methane leaks show up in the data
- **We have moved from model speculation to observational confirmation that mankind is having effect!**

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- How to engage consumers on the demand side
- **Jacob Levine**:
- How many people have checked facebook this week? Who has checked their finances? Have you checked your energy consumption?
- We spend less than 10 minutes a year thinking about our energy consumption!
- The Prius is an engineering marvel of energy efficiency
- However, behavioral science plays a big part as well: dominant real time MPG dashboard influences consumer behavior
- Opower have saved more than 6 TW electricity in the first 6 years and it scales: this year 3 TW are projected (about to exceed the amount produced by the Hoover Dam)
- State policy has to enable companies like Opower
- **We have to engage people along with the built environment**

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- Urbanisation and sustainable architecture
- **Edward Ng:**
- City and building design, over 50% of people living in cities, this will go up to 70% by 2050
- China builds cities fast, it makes one "London" in 5 years
- Densification
- More energy needed to maintain quality of living
- People move up to middle class from farming and demands go up at a staggering rate
- 2 whitepapers from Geneva conference, **capacity** and **needs** to deal with cities in the future
- We know the problem and we know to solve it, but it is difficult to translate things into action
- Policy happens on a 5 year term
- People do not care about what happens in the long term
- We are still locked into 19th century methods in making cities and can not accommodate the fast change
- **Fundamental challenge of translating the approaches into action**

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- Green spirals
- **Jon Zysman:**
- What generates policy support for green technologies?
- Doing things from the top down is difficult, bottom up approach generates spirals
- The problem: "green" starts with significant disadvantages, it is more expensive, nuclear is either completely green or black (catastrophe)
- Why do sprouts of green policy happen?
- Coalitions aimed at specific small problems, e.g. Denmark's natural security issue of being dependent on imported fuel
- Ozone issue: resistance overcome as companies realized they could make money of substituting pollutants
- Green jobs strategy starts addressing a concrete problem
- Start with narrow problems and policy, particular solutions
- Use that initial support to build a broad coalition
- **The key is not only choosing the most effective policies but also the ones that keep going and are sustainable**

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- China vs. US, how could they cooperate on green energy?
- **Dan Kammen:**
- Solution science, interface of energy projects and information
- Understanding how many jobs are created per investment, etc.
- How to make that a platform?
- Countries can cooperate so that companies can compete
- High resolution models of regional energy systems
- Not being locked into a preexisting world
- Switch model
- On grid vs. Off-grid world
- Micro grids need to be able to plug in at a later stage and become assets
- Example of solar lights
- Companies from 0 to 150000 customers in a year due to scalability

- **General Questions by David Dornfeld**
- Engineering perspective
- Companies want to save money
- How can we engage companies to speed up
- Life cycle assessment
- California has strong regulations
- Innovation and clear policy environment leads to private sector activity
- Grid companies are powerful channels for delivering and aligning these incentives
- Simple models need to be provided for businesses to make assessments and justify the expenses
- What regulatory structures would we want that allow utility companies to get on board?
- Not all companies have the resources for large assessments

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- **Water**
- Can we learn from the experience in energy to address the water situation?
- Agencies are banking on the water cycle remaining the same it has been for centuries -> bad approach
- Water does not disappear but it will fall down in different places
- Wet areas will get wetter and dry areas drier
- Water table dropping by several feet a year in southern states
- It is a non negotiable resource
- On a systems level for energy production using air cooling rather than water cooling
- We need to start pricing water
- Use big data to be more honest about the water use
- If you do not measure it, you do not know if you are doing a better job
- Energy and water are not separate
- Cities need to be designed based on locally available resources
- We do not know how much water we use
- Drought in Brazil: reservoirs down to 5% of its reserves

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- **Discussions from the floor**
- How should we be thinking about levelised policy control
- At certain levels of leakage (2.5%), gas is as bad as coal
- Leakage can be as bad as 7-8%
- Gas will probably not remain cheap or remain the ideal fuel
- EPA characterizes point sources, their estimates are to low by a factor of 2
- Which kind of renewables to subsidize

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