Meeting the Climate Protection Challenge in the Real World

John Shinn

Engineering Change Lab, March 2021

Food for Thought

- Relevant experience and beliefs that resulted.
- Observations on attaining deep decarbonization and resilience.
- Implications for Engineering Education and workforce building

Relevant Vitae -
33 years addressing climate issue in energy industry

- Berkeley. PhD ChE '79

- **Chevron** advisor 32 yrs ("inside the beast")
  - -**Greener refining and products** technologies;
  - -**Greenhouse gas management 1987-present**
    - capture and storage projects,
    - policies, c markets,
    - flare mgmt,
    - effective corporate strategies and mgmt mechanisms;
  - -Responsible **community development** support
- Elected **leader of oil industry climate management group** post Kyoto Protocol
- Startup staff of **World Bank** public-private partnership to address flaring. 11 years operating successful partnership.

- **Engineers Without Borders** Governing Board Advisor – 02-12
- **USDOE/national labs** stakeholder advisory board chair
- -Carbon capture tech dev and deployment accelerations.
- -Optimizing evolution of power system (IDAES).
- **Advisory boards** at Lbnl, Llnl,, Pnnl, Sandia, MIT, Caltech, Stanford, CMU,,,...

Attaining Deep Decarbonization and Resilience

- **Least cost pathway** ensures both least resistance and allows deeper reductions sooner.

- **Bridging strategies essential.**
  - From where we are to someplace better. Don't underestimate inertia. Agility.
  - Integrate with infrastructure replacement and "More-Sustainable Development" strategies.

Attaining Deep Decarbonization and Resilience

- **Think global and local, act global and local**.
  - All countries need to be involved.
  - California must not only be responsible themselves but actively contribute to global success.

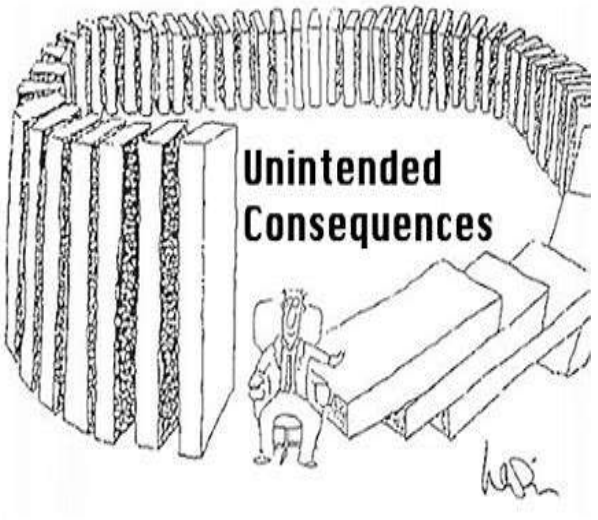
- Highly multi-disciplinary - Need to **bring forces together**
  - Economic, political, environmental, economic development, technology dev and social forces synergizing and balanced for common good.
  - Public-private collaborations

Attaining Deep Decarbonization and Resilience

- **All strategies and approaches needed.**
  - Wedge studies - Job too big fit any single approach.
  - Cost curve studies – Site dependent; essential to identify and act on low cost options

Attaining Deep Decarbonization and Resilience

- **Beware unintended consequences**.
  - Very complex interactions of climate protection, environment, economy, security, water, human well being.
  - Mandating expensive climate solutions creates resistance, slows progress toward more critical dev needs like clean water and air, medical or push emissions to less restricted or higher poverty populations.



Attaining Deep Decarbonization and Resilience

- Can we **harness capitalism** to perform in the interests of people and planet?
  - **Positive policies.** Reward better investment.
  - Mobilize **new generation of innovators and entrepreneurs** with true econ-envt-social balance

Implications to Engineering Education

- **Must attract and create new workforce**
  - Trained from early to advanced education levels
  - Who can integrate climate mgmt and resiliency needs into all aspects of our future paths in transportation building agriculture education….
  - Who can effectively collaborate with other disciplines
  - Who have experience of success built into their education