Summay of Session 1 (US, Denmark, CA projections for 2050 - 100% renewables)

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Session 1

- Patricia Hoffman, U.S. Department of Energy "Maximizing Renewable Energy in the U.S. Electric Grid"
- Brian Mathiesen, Aalborg University "Benefits of 100% Renewable Energy Systems for Denmark"
- Max Wei, Lawrence Berkeley National Laboratory "California's Energy Future: Scenarios for Achieving 80% emissions reduction in 2050"

Patricia Hoffman

- Why renewables? Economy, Security, Environmental Impact
- Metrics needed (improvement electrical system)
- Some guiding principles Minimizing cost to consumers. No one size fit all
- Strategy Generation (balance between central and distributed), Transmission (sensors, feedback), Consumers (demand response)

QUANTUM ELECTRONICS

Patricia Hoffman

- Key issue about generation (Variability vs. Dispatchable –natural gas role)
- Predictibility of resources
- Energy storage (need response with different time scales)
- Vehicle to the grid
- Impact of demand response (10-20%)
- Cybersecurity issues
- R&D: better forecasting, dispatch, control in a wide area, integrate (policy/techn./usage…)

QUANTUM ELECTRONICS

Brian Mathiessen

- Denmark energy system transformation (1972-today) –wind, decentralization, CHP
- Total energy unchanged (significant improvement in houses), but GDP growth 80%
- IDA Climate Plan 2050: 4 Targets: reduce GH emissions 90%, security of supply, energy/climate technologies, economic dev.
- Gasification of biomass (flexibility)
- Transport system change

QUANTUM ELECTRONICS

Brian Mathiessen

- Coherent energy analysis (EnergyPLAN.eu) – hour per hour data
- 100% renewable energy: could cost $2B less by 2050, create 30-40K jobs (5-6M people)
- Necessary technologies to get to 2050 goals exist
- Danish electricity prices (vs. US)

Max Wei

- California Energy Future 2050 report Included life cycle analysis
- Current study No LCA but more detailed on electricity
- Context global warming, mitigation/ adaptation AB32, new energy economy
- Emission = Energy x emission/energy (GHG intensity) Reduce both (cleaner fuels, more electrification)

Max Wei

- Scenario; Base Case: Aggressive efficiency, low C electricity generation, electrification of cars, low C biofuels Variant: biofuel supply (in-state vs. out of state), …
- SWITCH model for electricity cost optimization (Berkeley) LEAP model for fuels
- Space/water heating electrified (policy gap) heat pumps