

Moving Towards Energy Sufficiency and Transitioning from EE to Carbon Reduction Targets

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Resource Mobilization to meet hard targets in specific years.
Sustainability - "seeking enough and not too much" (Thomas Princen, *The Logic of Sufficiency*. MIT Press, 2005.)

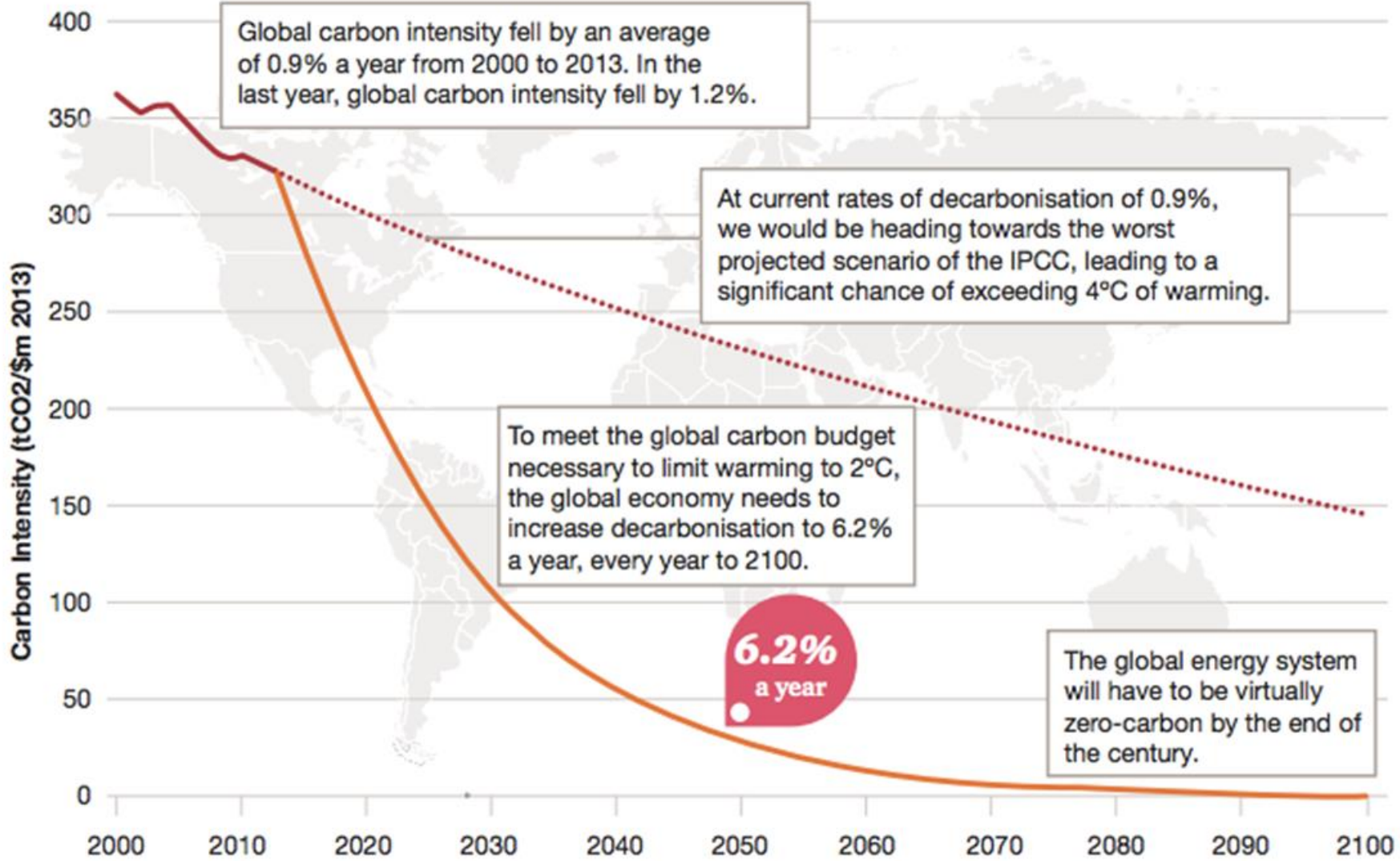
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Sufficiency & Decarbonization

- Energy Sufficiency is a state in which people's basic needs for energy services are met equitably and ecological limits are respected.
- Energy sufficiency also refers to an organizing principle for achieving that state.
- Decarbonization policy, is a subset of Energy Sufficiency, due to climate change within the overarching framework of "ecological limits".
- Energy Efficiency and related processes (i.e. demand response, energy storage, micro gridding etc.) becomes a means for achieving the larger goal of Decarbonization within the framework of Energy Sufficiency).

Source: Sarah Darby & Tina Fawcett, Introduction to Energy Sufficiency: A Concept Paper, ECEEE, 2018

Pathway to two degrees

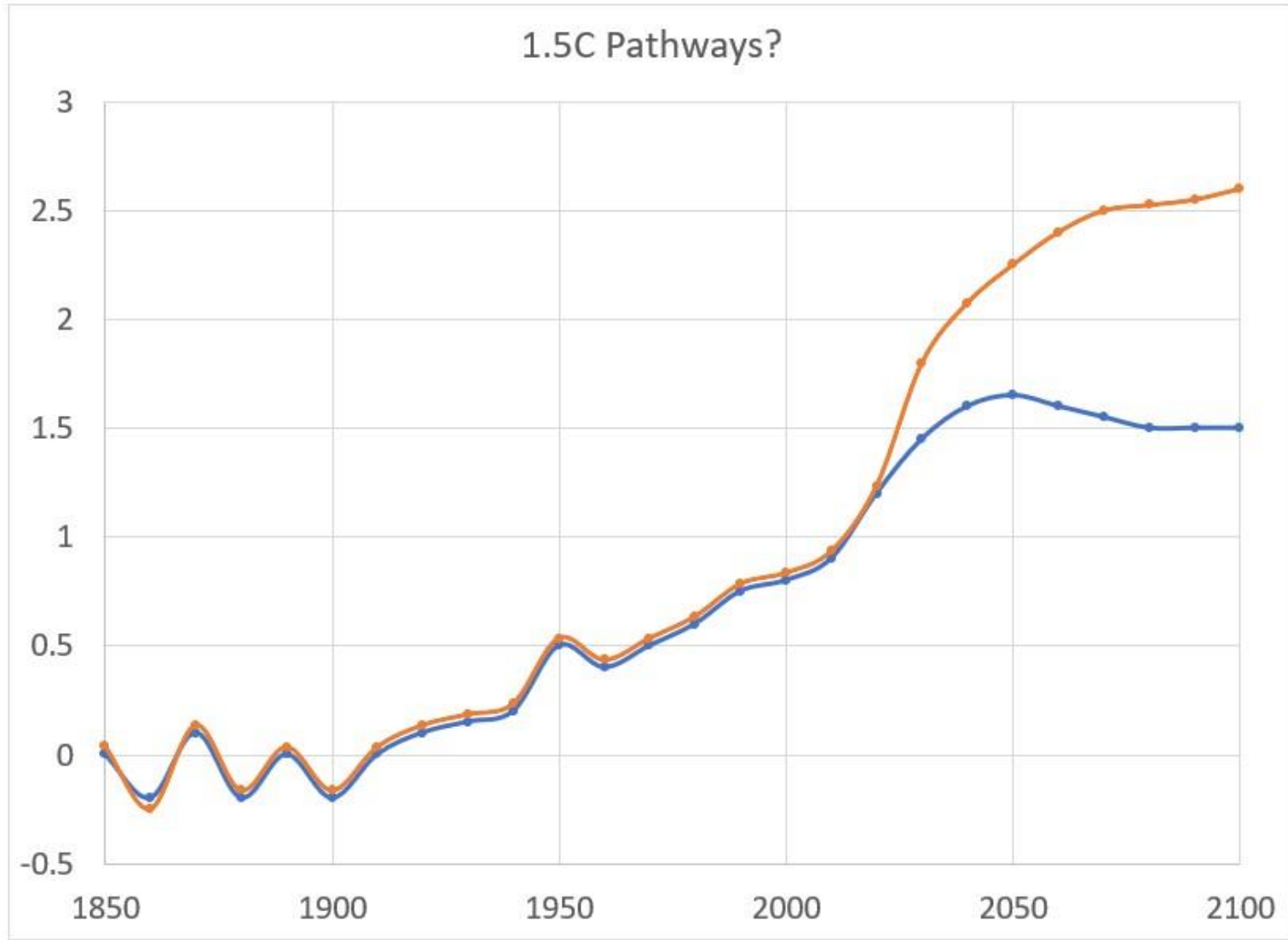


Utilities and Targets

Utility	Target
Arizona Public Service (APS)	65% by 2030 100% by 2050
Duke Energy	50% by 2030 100% by 2050
Excel Energy	80% by 2030 100% by 2050
Public Service Electric Gas (PSEG)	80% by 2046
Detroit Edison	100% by 2050
Vermont Gas	20% renewable natural gas by 2030
Dominion Energy	80% by 2050
American Electric Power (AEP)	80% by 2050

Climate Change Worse and Sooner than Expected

- At least 8 updated climate models have sensitivities that are higher than the 2011 range of 1.5C to 4.5C
- In November 2019 scientific paper shows major climate tipping points engaging much sooner than expected
 - Arctic Sea Ice (albedo)
 - Amazon Rainforest (carbon sequestration and carbon emissions)
 - Arctic Permafrost (carbon emission)
 - Boreal Forests (carbon sequestration and carbon emissions)
 - Tropical Coral (Ocean food and breeding chain)



Derived from: Shindell, D., Smith, C.J. Climate and air-quality benefits of a realistic phase-out of fossil fuels. *Nature* **573**, 408–411 (2019).
<https://doi.org/10.1038/s41586-019-1554-z>

Irreversible and Catastrophic

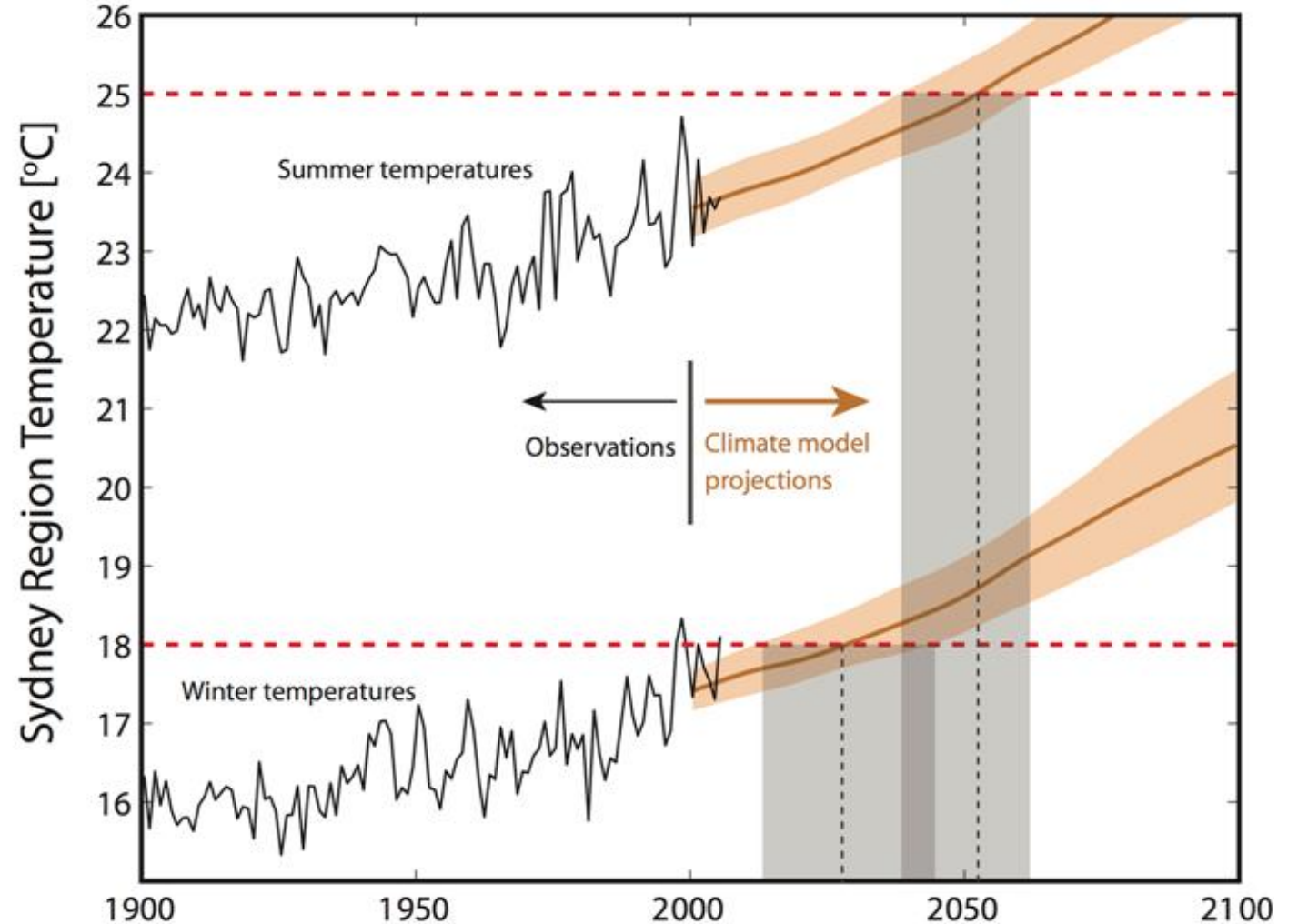
- The Real question is survivability and sustainability going forward
- Under this scenario, we cannot rationally prescribe the discounting of future benefits within the same context as before. (Cass Sunstein – *Worst Case Scenarios*)
- This new perspective disqualifies current cost test protocols from the program design process and includes concepts like Social Cost of Carbon (Societal Cost Test) but precludes current discounting methodologies (i.e. zero or even negative pure time discount factor & current cost of financing mechanism) since these do not reflect future time horizon sustainability targets.

Terms and Conditions

- Terms and Conditions are part of a current **Organizing Framework**
- Organizing Frameworks guide utilities, government and industry subject to socially determined **Terms and Conditions**.
- Policy determinations are multi-party and organizational and sometimes legislative or by action of a commission.
- We are not independent – We cannot use a decarb goal in planning unless it is authorized. Making Terms and Conditions more relevant is a cooperative policy process – especially in the realm of rapidly increasing implementation costs.

EVOLUTION OF ORGANIZING FRAMEWORKS

- **1970s - Energy Conservation**
Cut back, do without, avoid unnecessary use, find low-energy paths, ostracize squander and display
- **Mid 1980s - Energy Efficiency**
Same amenity for lower energy use and lower cost; least-cost planning; Amory Lovins: "The lunch you are paid to eat".
- **2015 plus - Energy Sufficiency**
Decarbonization, lower energy use, higher cost, fitting to the planet, rationing, resource allocation, sustainability, resiliency



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We Cannot Rule Out An Eventual National Mobilization (Command Economy)

- Galbraith – Office of Price Control WWII
- Coronavirus Real World Example – Defense Production Act, Massive Treasury Expenditure
- FERC Taking over ISO operations (market interconnection via National Transmission Grid)
- Mandate zero emission standard for light and heavy duty vehicles
- Stranded cost asset adjustment/bailout
- Nationalization of critical fossil fuel infrastructure that is necessary but no longer profitable (i.e. production distribution, refinement of oil)
- BioGas/Green Gas and Alternative liquid fuels production for air travel
- A national re-investment act for fuel switching, EE and DR and zero emission public transportation

Energy Sufficiency

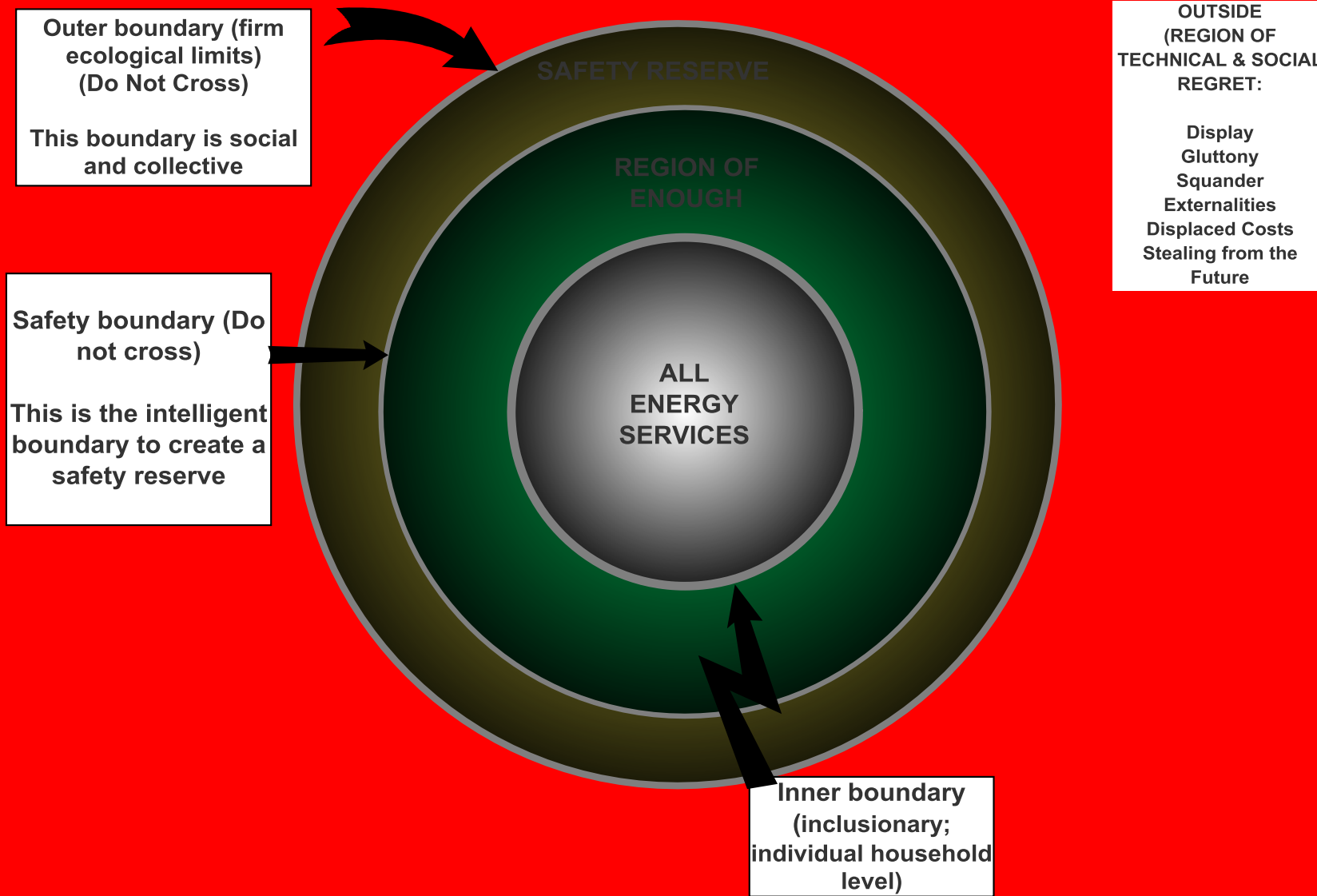
- Reduce the carbon intensity of energy
- Reduce the energy intensity of everything
- Resource Mobilization to meet carbon targets by defined dates – *costs will escalate*
- Privilege and extend long measure lives
- Avoid carbon locks/break existing locks



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ENERGY SUFFICIENCY DONUT

(Based on Sarah Darby & Tina Fawcett, ECEEE, 2018)



Energy Sufficiency – What it Means

- Promote Ecological Integrity – Across multiple generations
- Promote inclusion
- Avoid Excess
- Exercise Restraint and Respite
- Social Restraint is the logical analog to Ecological Constraint
- Include long-term impacts and look for displaced costs

Policy, Planning & Pilots

- Ally with government and public advocacy groups to promote active decarbonization
 - Promote “enough” rather than “more”, moving away from consumer economy towards inclusion and resiliency
- Make preparations to shift from least-cost planning to “necessity planning”
 - Expect limited predictability, overbuilding of program delivery above critical target thresholds – *Decision Making under Deep Uncertainty*
 - Redefine normal weather for planning and modeling
 - Extend time horizon for planning to include climate impacts through 2100
- Keep improving EE/DR/DERs and add sufficiency pilots

Sufficiency Program Goals (Prime Directives)

- We can do policy work to upweight carbon in the cost tests.
 - From a climate perspective, a goal is to upweight carbon in the benefit-cost models and it is no longer sane to discount the future if we want one (Intergenerational Sufficiency)
- Develop a coordinated marketing campaign to promote “Conscious Consumption” that is determined to be “Necessary and Enough”
- Where we can, we will use EE methods and frameworks – to optimize and contain program costs

Examples of Lock-in (Positives & Negatives)

- Resiliency investment in transmission equipment infrastructure (or not!) (positive or negative lock-in)
- New Oil and Natural Gas Pipelines (negative lock-in)
- Build out Renewable Gas, Net-zero emissions & UK Hydrogen Pilot (greenwashing with negative lock-in or positive lock-in?)
- Increasing appliance effective useful life and low carbon manufacturing processes (Dishwasher, Clothes Dryer, etc.) (positive lock-in)

Sufficiency Programs & Pilots (examples)

- Development and Retrofit of Hydro Resources to Pumped Hydro Storage
- Development of Autonomous Electric Vehicle Fleets as Public Transportation Service
- Residential and Small Commercial Electrification
- Industrial Process Heat Electrification with District Thermal Storage
- Residential Solar Bulk Purchase/Storage/Staging/Permitting & Standardized (2kW modular) design with battery storage option
- Distributed energy market development with FIT, Ancillary Service Charge and Marginal Carbon/Energy Cost development
- V2G time of use/time of supply tariff with municipal or industry day-use parking/charging facilities (concierge operated to allow V2G charge on solar peak and discharge to grid during duck curve ramp up).

Tools for Sufficiency Programs

- NSPM – Incorporation of *Policy Goals*
 - *Policy Goals - A jurisdiction's primary cost-effectiveness test should account for its energy and other applicable policy goals and objectives.*
- Electric Cost Allocation for a New Era (RAP Manual)
 - * *Policy Options - Provide several cost study results for a reasonable range of policy options for commission decisions*
- Utility & Government joint cost allocation
 - California – Residential Solar & Battery *Washington – Decarbonization
- ECEEE Sufficiency Pilots and Concept Papers
- New Methods Text - *Decision Making Under Deep Uncertainty*
 - Springer Publishing, 2019

Questions?



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Transitioning: What it will Look Like

Additional Bonus Slides Below!

Transitioning to Carbon Reduction Targets

- Planning and projects go beyond the traditional boundaries of EE
- Current specialties and skill sets will be useful but understanding engineering and physics will become more necessary.

For all Projects – The overarching Framework of Sufficiency

- The goal is to meet quantified decarb targets by certain dates
- Cost Control (regulated rate of return) will be necessary within some sub-subsectors of the economy.
 - Audits (evaluations), Verification of program activities, profiteering prevention methods (QA/QC), labor cost controls etc.
- Program design to achieve targets with appropriate administrative buffer based on performance uncertainty
- Understand and have a metric for expected rate impacts (pass through) that can be used to provide a mechanism for interim program adjustments.

For all Projects

- Devaluing the future will not work well, though it can be done for pieces of analysis.
 - The decarb goals are targets to be achieved by fixed dates. They inherently value the future over the present.
 - This is different from our experience with present-valuing and it leads to different analysis results and approval of different kinds of projects.

For all Projects

- Although some projections show beneficial electrification as a least cost path, this is unlikely for the duration of transition.
 - Substantial build-out of whole systems is required without the usual delays
 - There will be substantial stranded capital.
 - The focus is decarbonization goal; the least cost goal is important but secondary.
 - Both electric and gas rates will rise during the build-out

For all Projects

- Effort will have to continue to broaden to include microgrids and other Distributed Energy Resources
- Renewable and green energy will need to be coordinated with traditional EE/DR/DERs programs

For all Projects

- It will be necessary to develop specialties in core decarb areas (buildings, transportation, etc.)
- Utilities have a long history of developing superior talent in certain focus areas.
- This is similar to how utilities develop knowledge and skills that support major accounts.

For all Projects

- Leveraging through external organizations (program delivery agencies, QA/QC, independent project proposals will be necessary).
- This is similar to how traditional EE has developed over time.