Making Choices: Decision Systems for Climate Action Plans

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ABSTRACT

Underlying the American College and University Presidents Climate Commitment (ACUPCC) is the proposition that institutions of higher education are uniquely equipped "to model ways to eliminate global warming emissions … by developing institutional action plans for becoming climate neutral."[1] At the heart of any plan to reduce GHG emissions is the need to make choices among a variety of potential actions. The authors draw on their experience working with Cornell University, Ithaca College, and other ACUPCC signatories to explore the decision systems by which these choices are made, and the processes by which members of the university community are engaged in those decisions. This presentation will use an interactive tool to illustrate how various factors influence choices, and discuss the implications for crafting similar systems for corporate and municipal organizations. The authors then explore the implications of these tools and processes for the development of a workforce to successfully implement these plans.

A Decision Process

In a world of constrained resources, we must make choices. And the challenge of the climate action plan process is to not simply choose, but to make the *optimum* choice: the one best-suited to the unique circumstances of each institution.

To make the optimum choice, the decision process must be *transparent*. A transparent process articulates the basis for making choices early on, so the various constituencies may be satisfied that the process will be fair (and further legitimizes community engagement). It also allows the institution to say "no" to ideas that may be vogue, but not the best use of their next available dollar or hour.

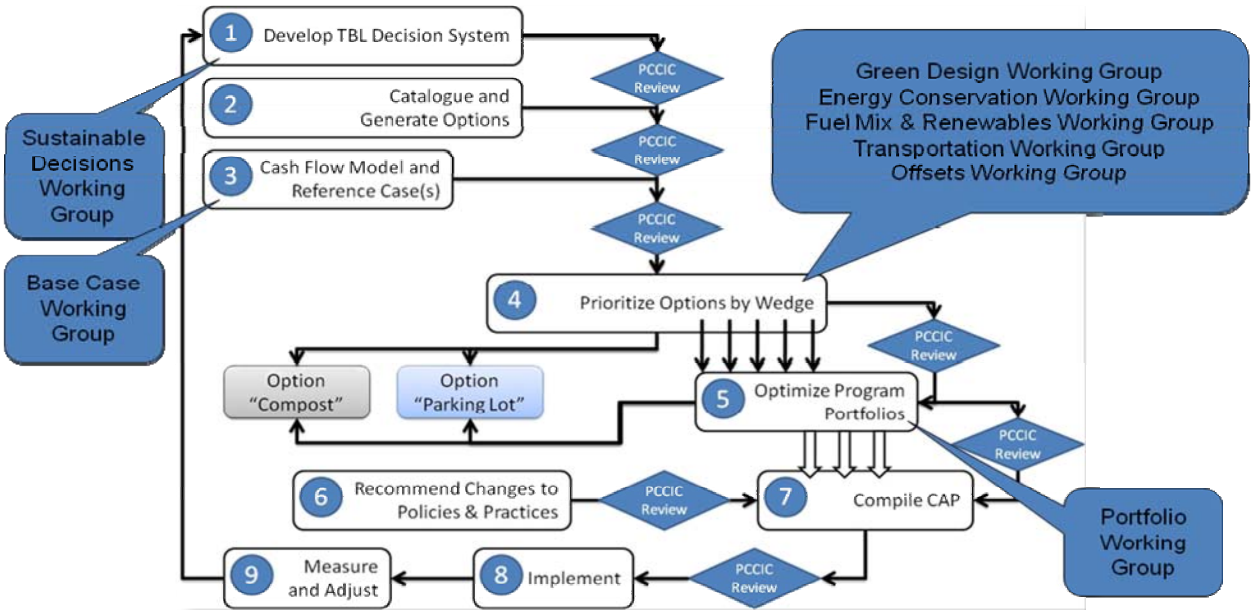
A transparent process also captures the assumptions behind each choice, so the continuing relevance of both the assumptions *and* the choice may be reconsidered as circumstances change in the future. This implies that the climate action plan is a living document whose actions will be continually questioned. To achieve a transparent process, it is necessary to "decide how to decide" *before* considering potential actions.

In the end, the decision process should *ideally* yield a "sustainable decision quality" that has the following ten attributes: (1) a commitment to well-defined action, after (2) considering a full range of creative and doable options, (3) applying logical reasoning, and (4) employing reliable and meaningful information to (5) make values and tradeoffs of alternative courses of action clear, in light of (6) well-articulated environmental, social, and economic principles values and objectives, (7) based on the core principles, values, and objectives of the institution via a process that is (8) transparent to stakeholders (9) providing the basis to learn and improve

[1] See http://www.presidentsclimatecommitment.org/about/commitment

through look-back and ongoing adjustment, and (10) broadly accessible to others to enhance their ability to make quality decisions with respect to climate change and sustainable practices.

The effort to achieve this level of decision quality will likely be an evolutionary, multi-year effort for most organizations. If the decision tool is uses estimates and rule-of-thumb calculations to inform early choices, it must have a robust capacity to be "built out" with more-detailed criteria and analysis in future years.



Community Engagement

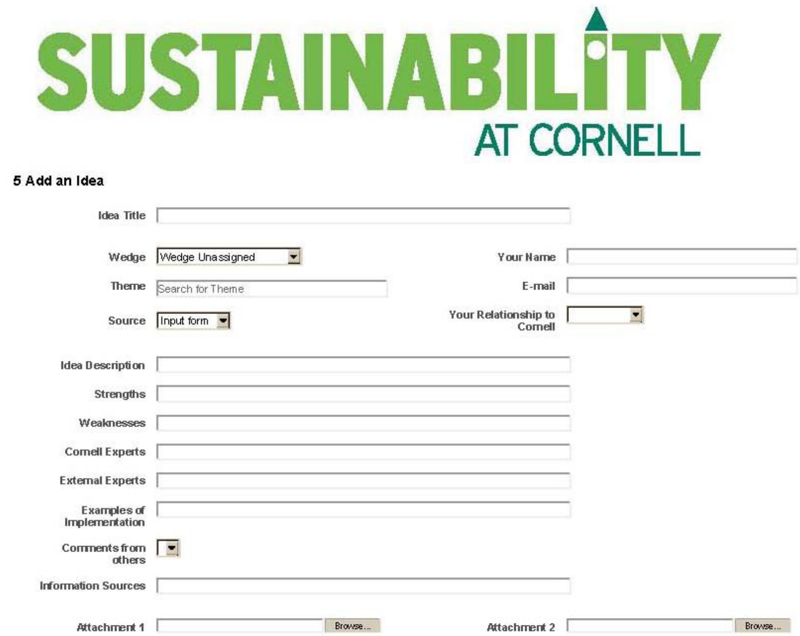
Interviews

Before developing the above process, we interviewed 26 people who represented a cross-section of the university community. Our goal was to (1) identify the interests and issues of the various constituencies and (2) identify the triple bottom-line (TBL) values that would inform choices among potential actions to reduce emissions. These values were compiled into the list shown at right. These values would later be used in the decision tool as noted later in this paper.

Institutional	Economic	Social	Environmental
Furthers Cornell Mission: Teaching Research Outreach Public service	Economic Stewardship	Employee, student well being	GHG management hierarchy & net GHG impact
	Regional economic development	Quality of life in home communities	Extent to which existing or potential environmental services of land and natural resources are conserved, enhanced
	Investing in sustainable value	Business ethics	
Student access to higher education	Resource Stewardship	Impact on campus/ community aesthetics/ appeal/functions	Sustainable land use, smart growth, minimize development footprint
Establish Cornell as a thought leader and early adopter		Impact on faculty/ staff/ students	Enhance air quality, exceed standards
Recognized environmental leadership (Top 5?)		Will this still seem like a good idea in 20 years ?	Sustainable use of water, other natural resources
		Broadly applicable, replicable, transferrable	Minimize hazardous waste and handle safely

A Web-Based Tool

The tool, shown below, was used to solicit ideas from the university community. This tool was intended to *engage* the community in the process of making choices. The web site was structured so people track the status of their idea. They could find out if their idea was accepted, combined with others under a broader theme, or rejected (… along with *why* it was rejected). This kind of transparency is important for people to feel that their input is valued, and not part of a token process.



It is important to consider *all* possible actions. Arranging potential actions by either metrics (mtCDE[2]/square foot, mtCDE/person, mtCDE/unit of energy) or underlying strategy (reduce demand, improve efficiency, switch fuels) – or both – will help people assess whether any stone is left unturned.

A Decision Tool

To date, the decision tools that have been developed are primarily MS Excel-based applications, sometimes supplemented by web-based tools (as noted above) to capture input and organize information. As the principles and methodologies are refined and evolve, the process and tools could ultimately be embodied in dedicated software applications, total web-based solutions or any number of available technology platforms. Independent of platform, the objective was to create a tool that not only informs immediate choices, but also captures the assumptions behind each choice to inform future decisions. Inputs are those necessary to characterize (1) the carbon impact of possible futures, and (2) potential actions to alter those impacts. Let's review the necessary functionality by considering the inputs and resulting outputs for each.

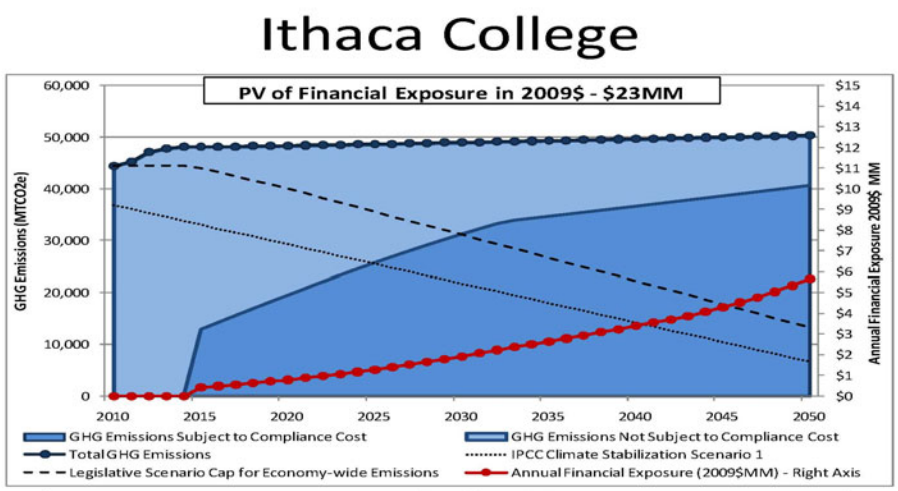
Characterizing Possible Futures

The greenhouse gas (GHG) inventory is blended with institutional trends and forecasts to yield a "Base Case" that characterizes business-as-usual trends into the future. By folding possible future greenhouse gas regulatory scenarios into the Base Case assumptions, we also

[2] "mtCDE" = metric tons of carbon dioxide equivalent

estimate a possible range of financial exposure to which the institution may be subject in the future as a result of a carbon tax, cap-and-trade system, or other regulatory schemes currently being considered by the federal government.

While the near-term likelihood of cap-and-trade is uncertain, there is little doubt that carbon emissions will eventually have a price. This estimate of future regulatory cost impacts is completed before we consider the cost and benefits of potential actions. It is thus a compelling tool to persuade the board of trustees and capital budget officers of both a risk and an opportunity, and is often used to make a case for proceeding with the development of a full climate action plan (in which the costs and benefits of potential actions are evaluated).



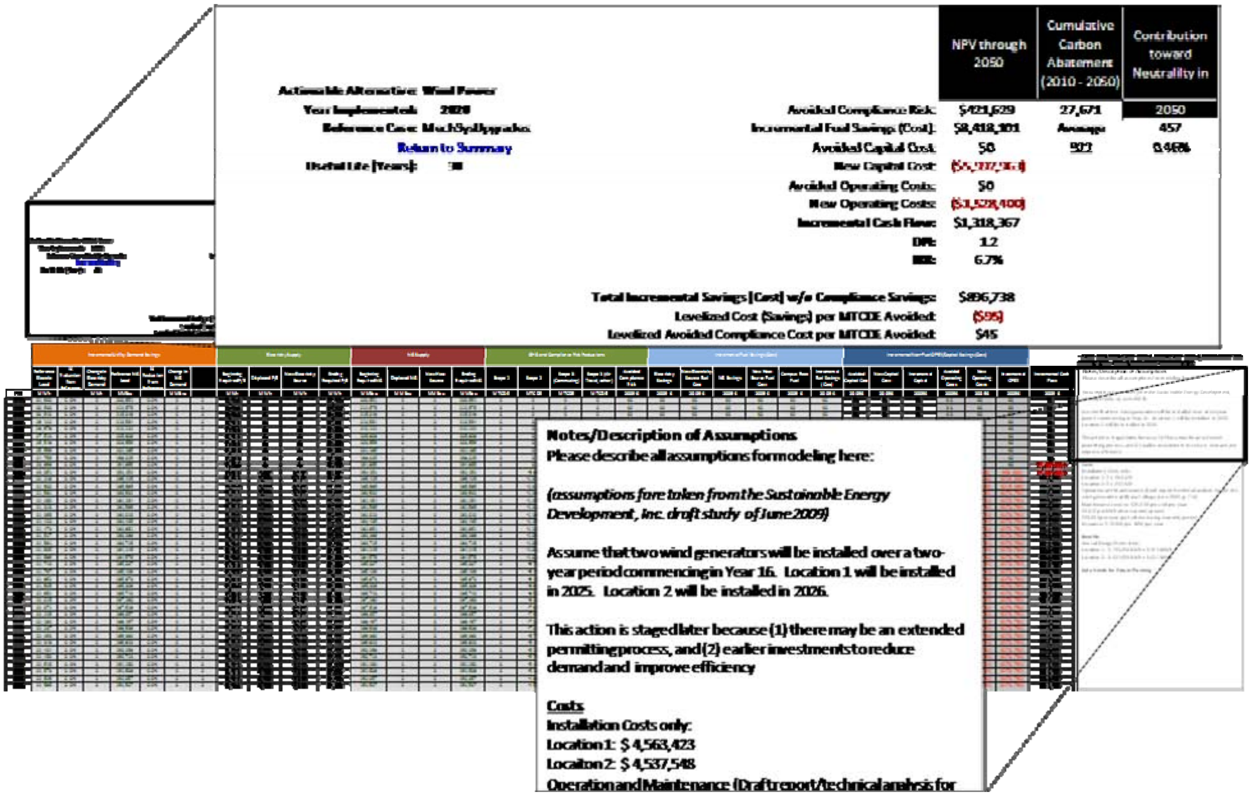
Sources of Compliance Costs			
Scope 1: Stationary Combustion	29.4%	Scope 3: Air Travel	7.7%
Scope 1: Mobile Combustion	2.6%		
Scope 2: Purchased Electricity	60.3%		

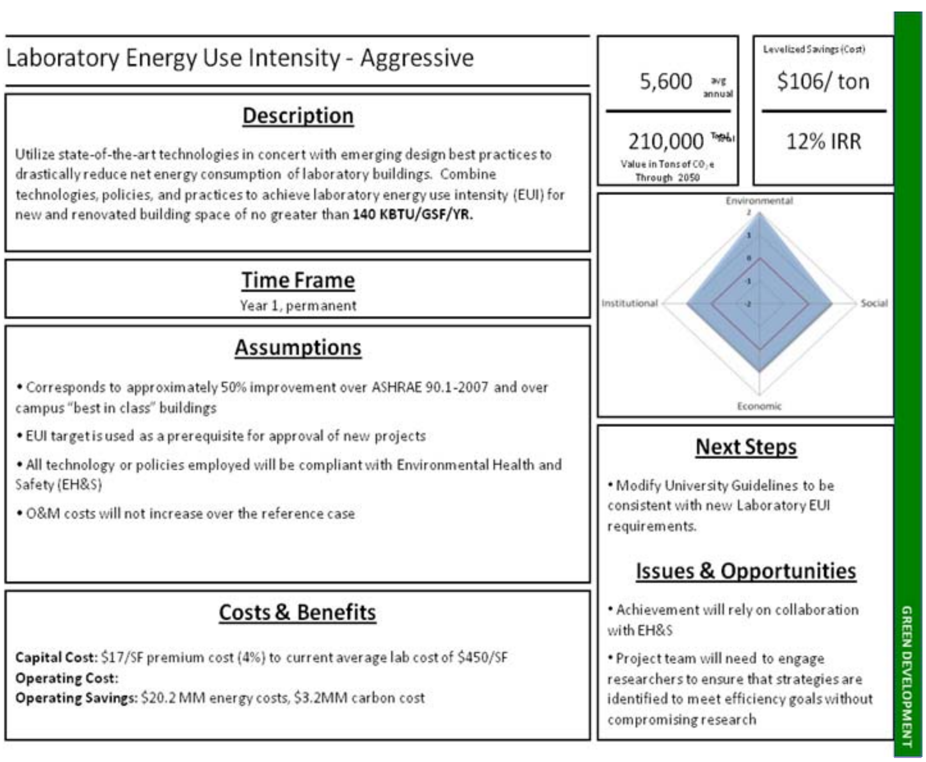
Characterizing Potential Actions

Potential carbon-reduction actions need to be described in both quantitative and qualitative form. Identifying quantitative costs and benefits translates ideas ("let's do solar") into *actionable* alternatives ("a $2 MM solar installation saves $200,000 annually and reduces our carbon footprint by 3%") that may be compared with competing actions.

One carbon-reduction action is characterized in the sample spreadsheet at the top of page 5. Cost and benefit inputs are captured in the bottom columns, along with a brief narrative (in the far right column) so decision-makers understand both the assumptions *and* the level (or lack) of accuracy underlying them. Outputs are shown in a single screen at the top of the page. This allows us to scroll through individual actions as we begin evaluating and comparing them.

Some actions will yield carbon reductions that may be calculated with a high degree of certainty. Equipment efficiency upgrades are one example. Some actions, such as incentive program to encourage the use of mass transit, may yield less certain results. In the latter case, the decision tool needs to account for the reduced *surety* of the actions (i.e. how *sure* we are that the carbon reductions will be realized).

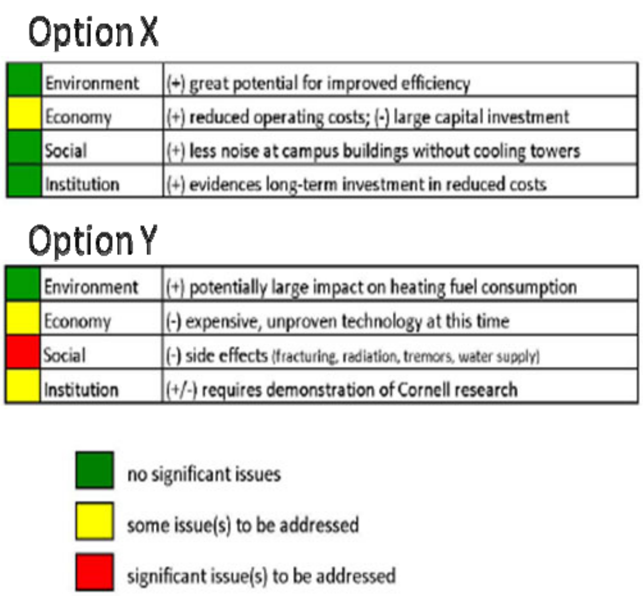




The format at left pulls information from the spreadsheet into a simplified summary of the costs, benefits and assumptions behind each potential action. The *qualitative* TBL+ factors are characterized graphically so their impact may be considered alongside *quantitative* costs and benefits.

The cost numbers are always the attention-grabbers, so it's helpful to make TBL+ graphics either larger or brighter to get people's attention. Note how the graphic is positioned *directly below* the cost numbers.

Most technical analyses of actions to reduce GHG emissions focus on financial costs and carbon-reduction benefits. But a broader net should be cast. The core values of the institution – including triple-bottom line factors – should inform choices among carbon-reduction actions. Incorporating these "TBL+" factors is challenging because their costs and benefits are not easily quantified. We therefore tried a variety of methods (discussed on pages 6 and 9) to capture the community's *qualitative* sense of costs and benefits.



From practical experience, we discovered that time spent trying to quantify TBL+ factors – shown above as ranked on a scale of -2 to +2 – wastes a good deal of effort on neutral actions (-1 to +1). That effort is better invested in identifying actions that have strong positive and negative attributes (either +2 or -2).

Thus, we evolved the numerical ranking to color signals shown at left (green to be very good, red to be troublesome, with yellow in the middle). This allows decision-makers to focus on those actions with strong positive or negative TBL+ attributes.

It is also possible to use variations on methodologies developed by third parties (e.g., the STARS methodology developed by AASHE[3]).

But *how* to rank TBL+ factors is a downstream issue. It is necessary to first capture the community's sense of the criteria by which these factors should be weighted. The adjacent chart illustrates one such inventory.

Our original notion was that the TBL factors are realized *only* as they flow through the institution, so institutional values should be on equal footing with the three TBL factors.

These criteria represent a "value proposition" for the institution no less than the financial costs and benefits associated with carbon reductions.

Comparing Actions

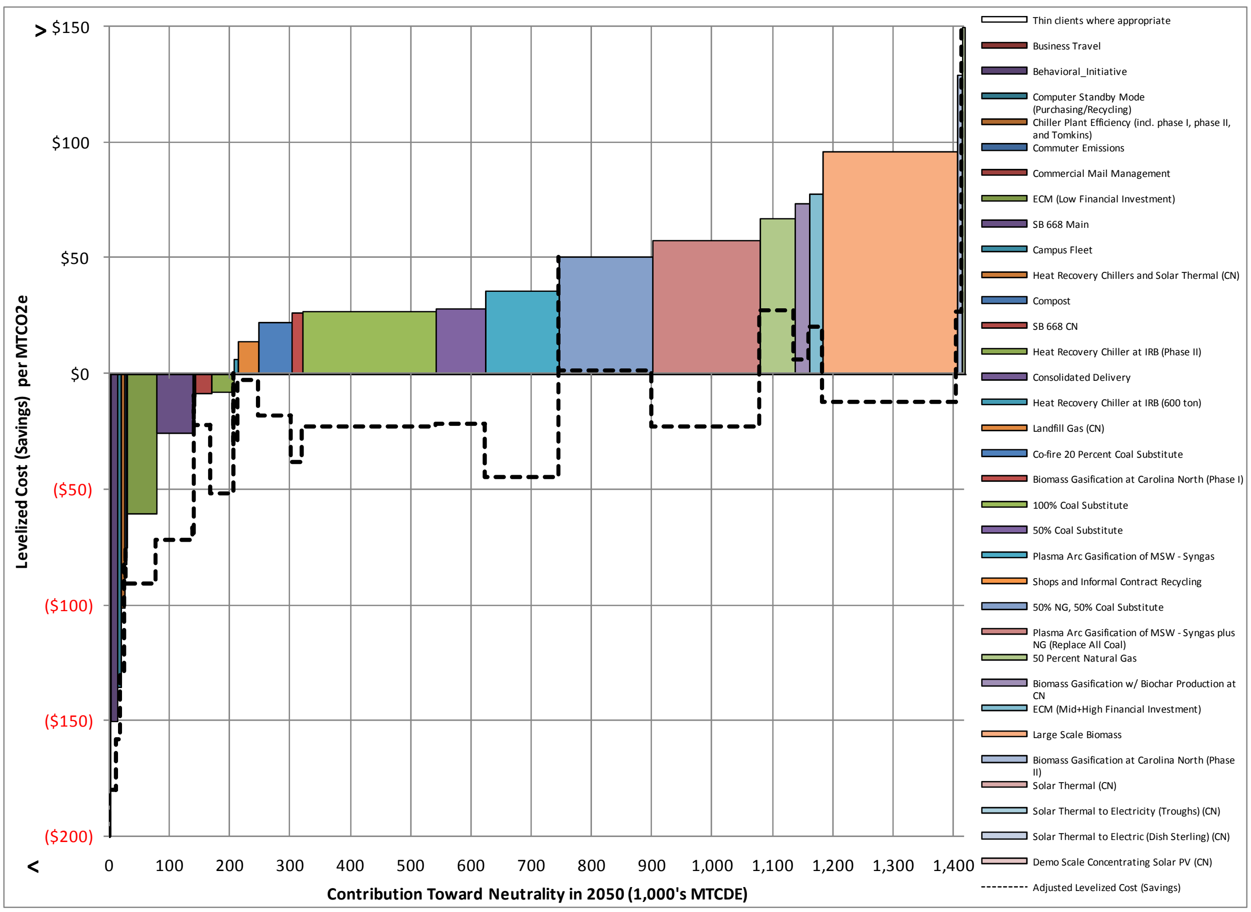
The abatement curve[4] shown below affords a quick visual comparison of the cost and impact of various actions. Each colored box characterizes a single action. The horizontal dimension represents the amount of the GHG reduction, while the vertical dimension represents

[3] "Sustainability Racking, Assessment & Rating System," Association for the Advancement of Sustainability in Higher Education [http://stars.aashe.org/]
[4] This "abatement curve" has its heritage from the "resource supply curve" (or "stack") that has historically been used by electric utilities to determine the most economic dispatch of resources as part of their integrated resource planning efforts.

the life-cycle cost. Boxes falling below the $0 line yield cost *savings* per metric ton of GHG abated, while those above the line have net *costs* over their life.

The dashed line represents the adjusted cost or savings in a future world where GHG emissions have a cost due to GHG regulations. Note the many actions that have net costs when GHG emissions *do not* have a cost, yet yield net savings when GHG emissions *are* assigned a cost. This tool helps the institution understand the possible impacts of changing assumptions about future regulatory trends.

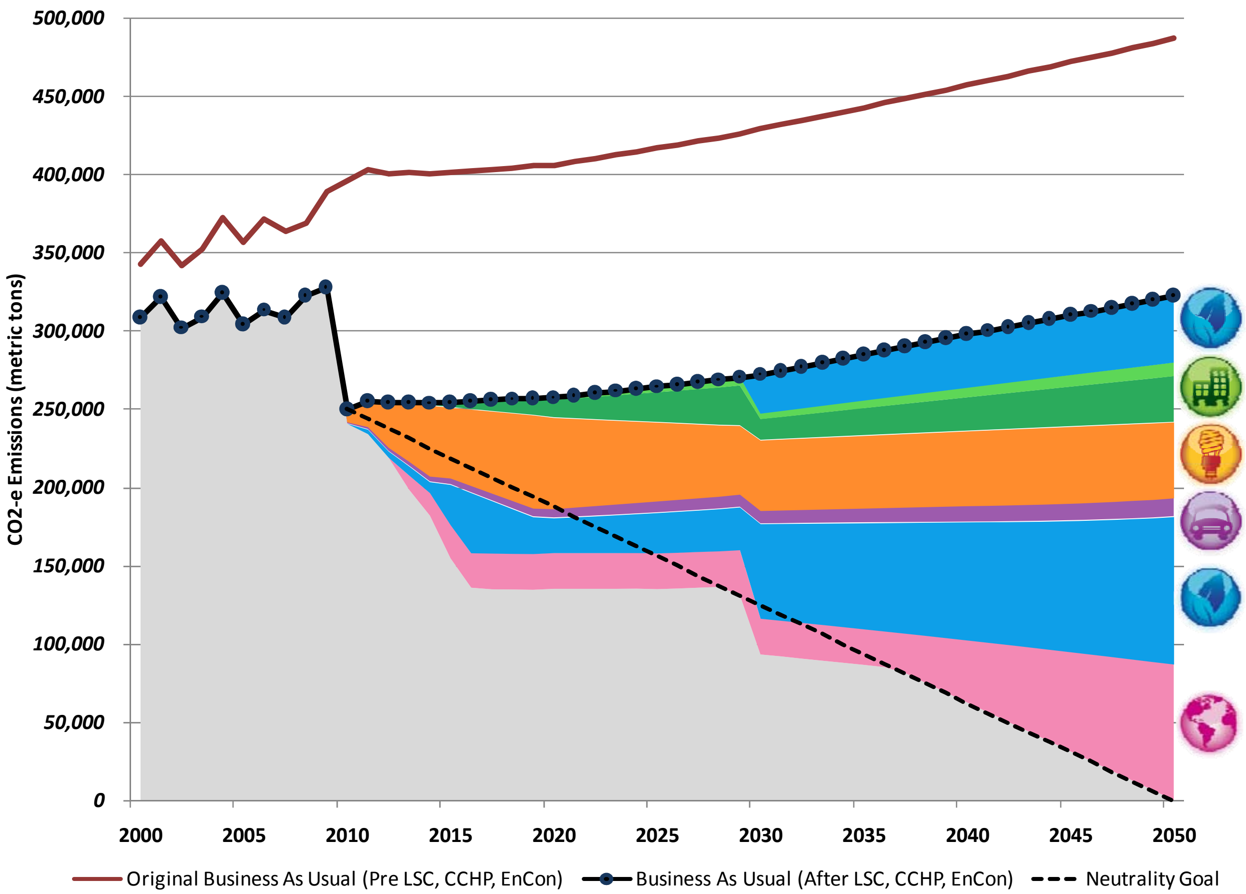
Since the present environment is one in which (1) carbon has no cost and (2) financial resources are constrained, most institutions are using the early years of their climate action plans to pursue lower-cost actions with quick paybacks. For smaller institutions with limited resources, they are prudently postponing decision on big-ticket items pending further analysis in future years.



Packaging Portfolios of Actions

A Wedge Diagram

Once the individual actions have been evaluated, they must be packaged into *a portfolio of actions* that collectively define the path to climate neutrality, most commonly represented by the wedge diagram[5] shown below. This chart shows "wedges" of actions (e.g., new construction standards, energy efficiency, switching of fuels, transportation, offsets) being phased-in and the carbon reductions resulting from each. While the details of the wedge diagram are beyond the scope of this paper, suffice it to say that the development of the wedge diagram is a formidable task. It may prove worthwhile to engage in some interim analyses to help frame both the challenge and the opportunities.



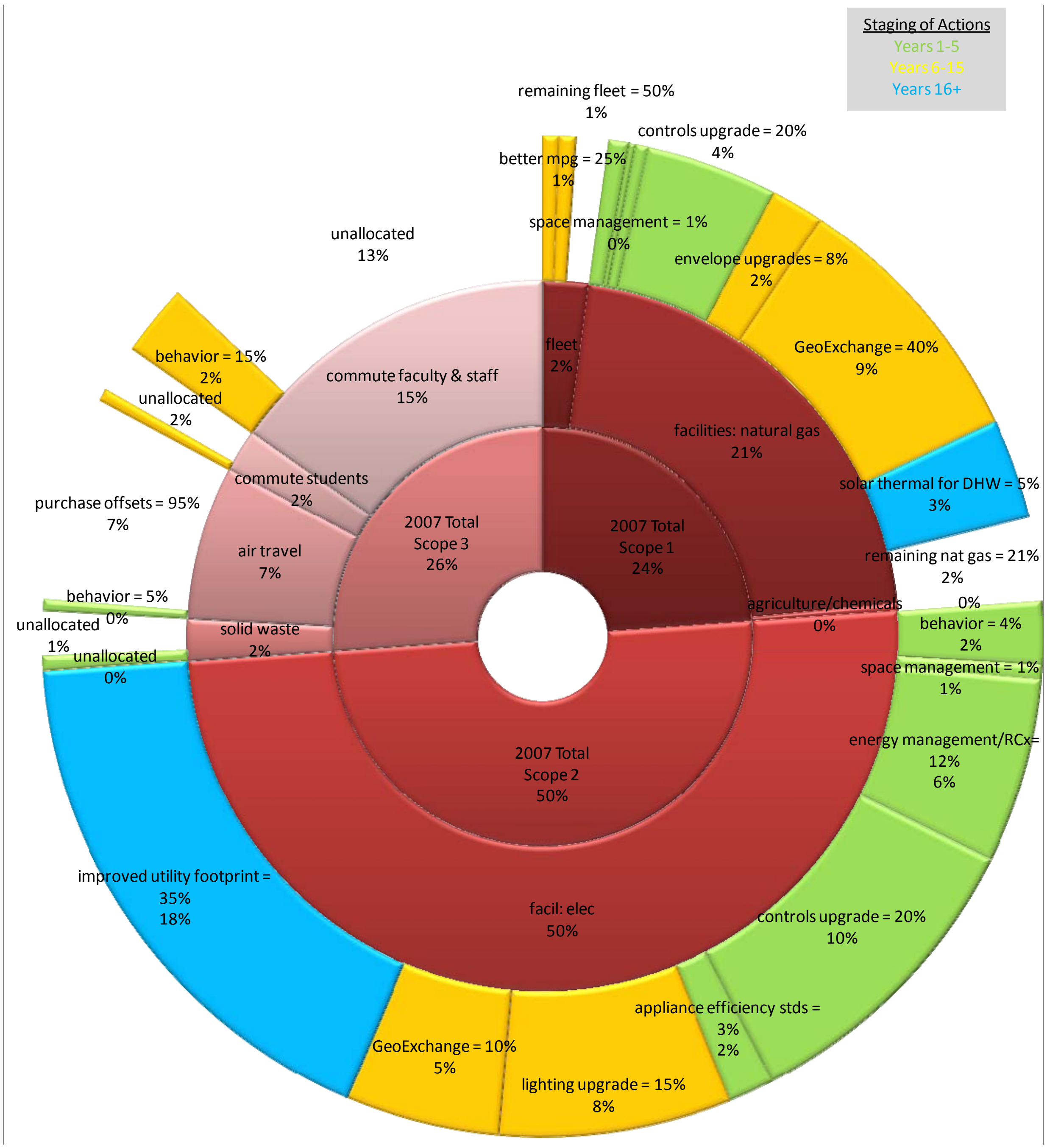
A Portfolio Sketch.

As an interim exercise, it may be worthwhile to develop a "portfolio sketch" (see page 9) that first characterizes the scope and source of emissions, showing likely near-term actions with gaps that need to be addressed. This tells a more fine-grained story than the wedge diagram, because it distinguishes potential actions by scope *and* source of emissions.

The portfolio sketch can capture initial assumptions of what *might* be done, so those assumptions may be validated with more detailed evaluation later. Note how actions with a higher degree of surety – and typically quicker paybacks – are staged for years 1-5. More

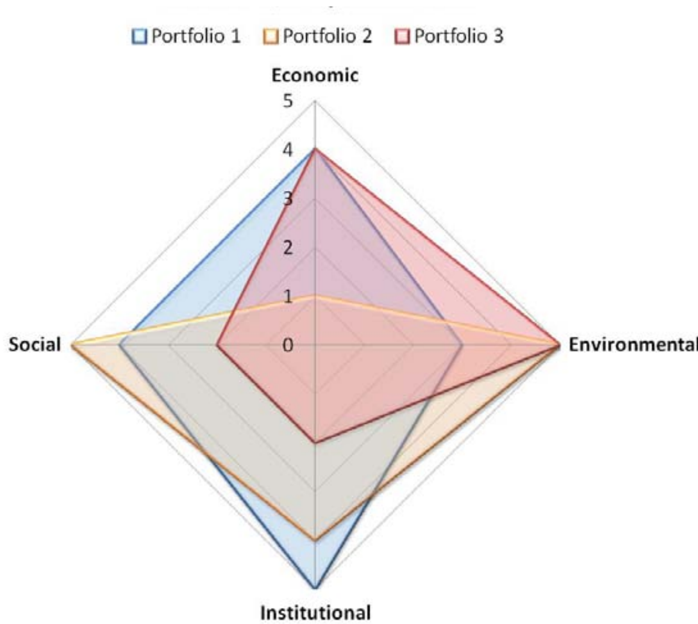
[5] Rob Socolow and Stephen Pacala, "Stabilization Wedges: Solving the Climate Problem for the Next 50 Years with Current Technologies," Science August, 2004. (Vol. 305. no. 5686, pp. 968 – 972)

expensive actions are stage for the following 10 years. Technologies that may prove economical in the more-distant future are staged for Years 16+. *(Some labels in this portfolio sketch have been removed for clarity.)*



Alternative Portfolio Paths: Weighting TBL+ Factors.

Climate action is about more than just financial costs and carbon reduction benefits. It is therefore reasonable for institutions to consider alternative portfolio paths that are more heavily weighted toward triple bottom-line factors and institutional values. The below spider diagram illustrates how individual actions may be packaged to create portfolios that reflect alternative "value propositions" of a different nature. For example, Portfolio 3 (red) has a greater environmental impact than Portfolio 2 (blue), which is stronger with respect to two of the other three TBL+ factors.



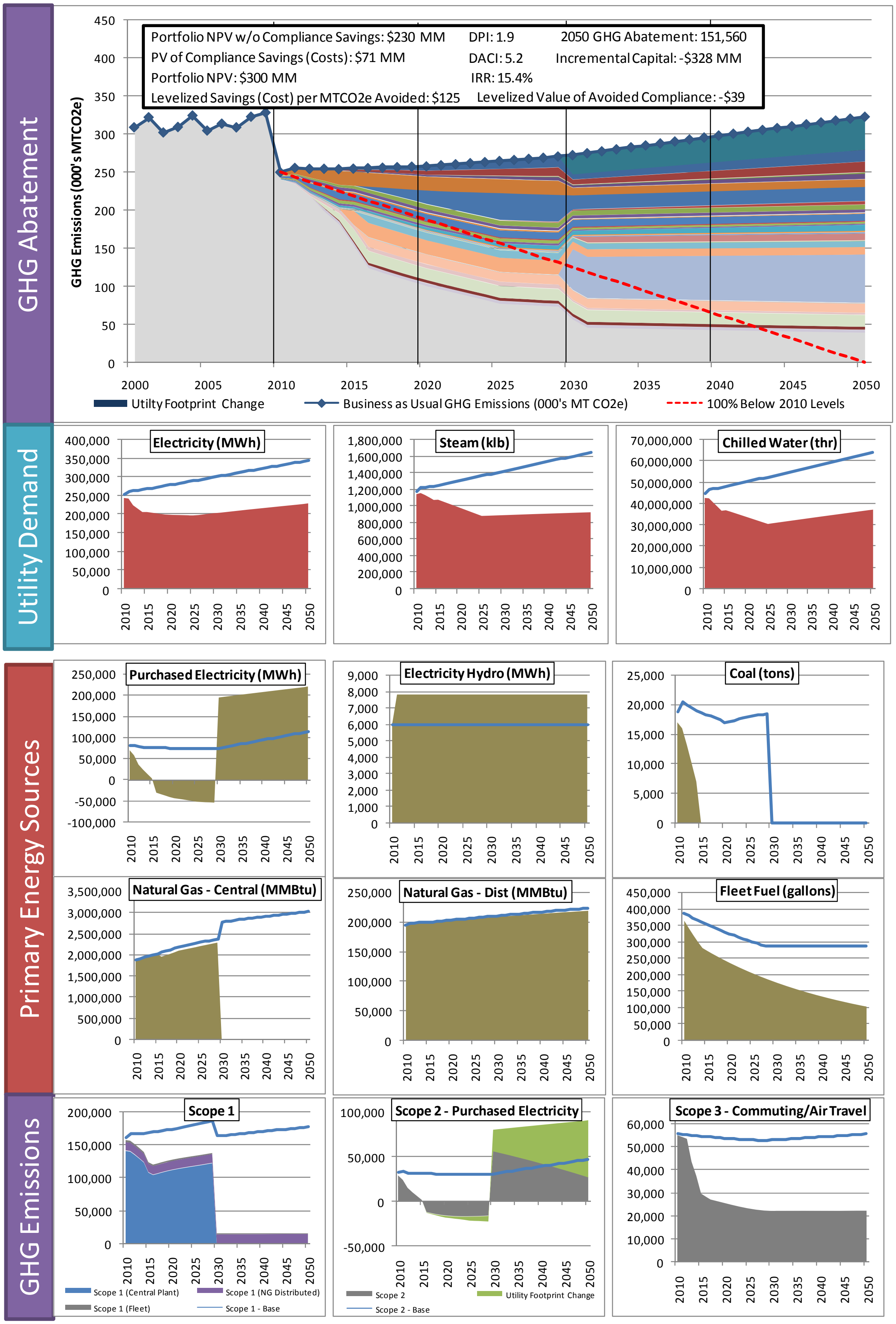
Dashboard Functionality

If broad engagement is desired, these portfolios can be developed in a cross-functional working group using dashboard functionality illustrated on page 11. The interactive nature of the tool allows participants to visualize the impact that each action has on overall objectives as actions are added to the portfolio.

It is our experience that this process of "playing" with a variety of scenarios as a group can yield greater insights into the key tradeoffs and opportunities available to the institution. Key metrics that are tracked on the interactive dashboard can include GHG emissions by scope, demand by utility type, sources of primary energy and cash flow/capital requirement.

Real-Time Monitoring

This ability to "play" with varying scenarios will also be necessary as the institution implements its climate action plan. The steady and continuous reductions necessary to achieve climate neutrality require ongoing monitoring of operations, along with commodity and capital choices. An evolved version of this tool should capture ongoing decisions and changes in assumptions to inform future choices.


GHG Abatement
Portfolio NPV w/o Compliance Savings: $230 MM
DPI: 1.9
2050 GHG Abatement: 151,560
PV of Compliance Savings (Costs): $71 MM
DACI: 5.2
Incremental Capital: -$328 MM
Portfolio NPV: $300 MM
IRR: 15.4%
Levelized Savings (Cost) per MTCO2e Avoided: $125
Levelized Value of Avoided Compliance: -$39
GHG Emissions (000's MTCO2e)
Utilty Footprint Change
Business as Usual GHG Emissions (000's MT CO2e)
100% Below 2010 Levels
Utility Demand
Electricity (MWh)
Steam (klb)
Chilled Water (thr)
Primary Energy Sources
Purchased Electricity (MWh)
Electricity Hydro (MWh)
Coal (tons)
Natural Gas - Central (MMBtu)
Natural Gas - Dist (MMBtu)
Fleet Fuel (gallons)
GHG Emissions
Scope 1
Scope 1 (Central Plant)
Scope 1 (NG Distributed)
Scope 1 (Fleet)
Scope 1 - Base
Scope 2 - Purchased Electricity
Scope 2
Utility Footprint Change
Scope 2 - Base
Scope 3 - Commuting/Air Travel

Implications for Workforce Development

Implementing the Climate Action Plan

To effect emissions reductions at the scale of an enterprise (be it public, private or NGO), the workforce needs to have **an understanding** of the scope of the problem, **a holistic perspective** of the potential actions to be undertaken, **an investment** in doing something about it, and **an incentive** to do the right thing.

To this end, the climate action planning process is itself a tool for workforce development because (1) it must first define the full scope of the problem, (2) consider a wide range of emission-reducing actions across a variety of jurisdictions, disciplines and trades, and (3) is fundamentally a constituency-building process to invest the community in a specific set of actions.

A holistic perspective. A climate action plan addresses emissions that result from all aspects of an enterprise's activities: buildings, transportation, processes and sometimes even materials. Evaluating actions to reduce emissions from multiple sources requires holistic thinking.

For decades, buildings were designed – and building codes were developed – on the assumption that, if each building system is designed to a specific standard, the building as a whole will function properly. The effort to extract ever-more performance out of ever-fewer materials has invalidated that assumption. To create a high-performance built environment, we must think of the building as a system. This requires an integrated design process that weaves together – and fills the gaps between – the various design and engineering disciplines.

The same applies when trying to reduce emissions at the scale of an enterprise. *The enterprise is also a system* requiring an integrated approach that crosses boundaries. This has profound implications for workforce development because – at least with respect to reducing emissions – it is no longer enough for people to do their own job assignment. They must consider the impacts of their actions (or inactions) on the community's effort to reduce emissions.

During the multi-year effort to reduce emissions, the community will need to undercover myriad emission-reducing opportunities that could not be conceived when the climate action plan was initiated.

An invested workforce. Carry this building/enterprise analogy one step further: we know that people are more likely to engage in energy-saving behaviors if they given feedback on their efforts (e.g., the Prius dashboard). So, too, must the enterprise create mechanisms by which the workforce gets feedback to inform their ongoing, collective efforts to reduce emissions.

The climate action plan – for all its technical and financial rigor – is largely a device to build a consensus around a defined course of action. Community engagement during the climate action planning process is a means to get people invested. And the community then needs to *stay* invested through the multi-year effort to reduce emissions. That community-scale engagement is necessary because emissions will ultimately be reduced by the collective actions of the people who comprise each enterprise.

An incentivized workforce. To reduce emissions from "business-as-usual" patterns, enterprises cannot conduct business as usual. They must reconsider the incentives that drive workforce "behaviors-as-usual."

For example, the effectiveness of maintenance functions – along with the people who do the work – are often judged on their ability to reduce complaints. This may cause people to make choices that quiet the complainer, though use *more* energy and generate *more* emissions.

Consider the "expanded range of thermal comfort" commonly recommended to reduce cost of heating and cooling building spaces. Unless the workforce understands why it's a little warmer in their workspace – along with some personal interventions to assure thermal comfort – they will call maintenance (… if they haven't already taken a screwdriver to the thermostat control).

The easiest path for the maintenance worker – motivated to reduce complaints – would be to turn down the thermostat or override the central control. To avoid this, the maintenance worker would need to be both empowered and have the ability to (1) understand the adverse impacts of the expedient localized solution, (2) explain the policy of expanded thermal comfort to the affected worker, and (3) offer the complainant alternative thermal comfort solutions specific to their work setting.

Overcoming this situation will require an investment in both maintenance activities (to do more than respond to complaints, but assure ongoing system performance) *and* maintenance workers (who need to do more than just repair broken systems, but keep them tuned to assure ongoing system performance). Maintenance staff must also be able to work with the workforce to assure that they understand and work with energy-saving/emission-reducing systems.

This is just one example from one function. There are dozens of other functions for which the subtle opportunities to adjust incentives are critical to achieving real reductions in emissions.

Skills & Roles to Develop Climate Action Plans

To show a *plausible* path to climate neutrality that can actually be *implemented*, a climate action plan must address actions that cross many roles, disciplines, and jurisdictions (facilities management, planning & development, space management, administrative management, human resources, capital planning, and process operations). More often than not, the requisite skills and knowledge will be found *within* the organization. The challenge is identify and access those disparate capabilities. Thus, a key role is played by the rare individual who understands all the role-players and can marshal their individual efforts to a collective enterprise.

Consider the necessary skills and attributes for two specific role-players: (1) the orchestrator of this climate action planning effort, and (2) the players in the orchestra. While each player must master their individual instrument, the orchestrator must understand each and – much more importantly – how they sound *together*. The orchestrator of the climate action planning effort must live in the interstitial spaces between the players.

The musical metaphor has one additional permutation: the orchestrator need not be the conductor. The orchestrator understands the sound, timbre and range of each instrument. But each performance is necessarily different. It is the conductor who ascertains the pace, volume and energy level of each performance, tailoring the capabilities of the players to the unique qualities of the space in which the music is performed… all the while understanding – and sometimes helping define – the expectations of the audience.

But the climate action plan is little more than sheet music, full of a potential that can only realized in performance. For the orchestra to play harmoniously to a common rhythm, each musician must both play their part *and* "hear" what the other players are doing. One player out-of-tune, off-tempo – or simply not playing – can diminish an otherwise fine performance. Actually, achieving climate neutrality will require that everyone play their part – and play it well.

This will require a workforce that is both individually *and* collectively capable. It will be less about developing worker skills than it is about developing a collaborative work*force*.