I. EXECUTIVE SUMMARY

The Blue Ribbon Advisory Council on Climate Change (BRAC) was organized by Governor Jon M. Huntsman, Jr. on August 25, 2006, to provide a forum where government, industry, environment, and community representatives[1] could identify proactive measures that Utah might take to mitigate the impacts of greenhouse gases (GHG).

Governor Huntsman provided the following charge to the Council:

1. Consider science, economics, and policy around climate change in a forum where we as a State – industry, environment, community – could have productive dialogue;
2. Understand and recognize what we are trying to leave for the next generation; and
3. Bring back information and policy recommendations for review and consideration.

This report provides a summary of the work the BRAC and Stakeholder Working Group (SWG) have conducted to date. The BRAC has completed a number of significant tasks as charged by the Governor. The Science Report is summarized in this Executive Summary and the entire Science Report is included as Appendix A of this report. A number of policy options are summarized and included in this report. The policy options are ambitious but achievable if the necessary resources are provided to implement them. Because of the volunteer nature of the BRAC and the limited time the BRAC has had to follow the Governor's charge, the BRAC has not independently conducted any economic cost/benefit analyses on the policy options. Such analyses may be necessary prior to implementation of some of the options.

In June 2007, Governor Huntsman requested that the BRAC also evaluate options for a Renewable Energy Initiative. The BRAC established a work group and will prepare final recommendations for the Governor in October 2007. Those recommendations will be included in this report in Appendix E.

THE SCIENCE OF CLIMATE CHANGE

As directed by the BRAC, the science report, "Climate Change and Utah: The Scientific Consensus," summarizes the present scientific understanding of climate change and its potential impacts on Utah and the Western United States and emphasizes the consensus view of the scientific community. The report also includes a discussion of confidence and uncertainty as defined by the BRAC. The Executive Summary from the science report is included below.

[1] BRAC members are listed in the Appendix C

"There is no longer any scientific doubt that the Earth's average surface temperature is increasing and that changes in ocean temperature, ice and snow cover, and sea level are consistent with this global warming. In the past 100 years, the Earth's average surface temperature has increased by about 1.3°F, with the rate of warming accelerating in recent decades. Eleven of the last 12 years have been the warmest since 1850 (the start of reliable weather records). Cold days, cold nights, and frost have become less frequent, while heat waves have become more common. Mountain glaciers, seasonal snow cover, and the Greenland and Antarctic ice sheets are decreasing in size, global ocean temperatures have increased, and sea level has risen about 7 inches since 1900 and about 1 inch in the past decade.

Based on extensive scientific research, there is very high confidence that human-generated increases in greenhouse gas concentrations are responsible for most of the global warming observed during the past 50 years. It is very unlikely that natural climate variations alone, such as changes in the brightness of the sun or carbon dioxide emissions from volcanoes, have produced this recent warming. Carbon dioxide concentrations are now more than 35% higher than pre-industrial levels and exceed the highest natural concentrations over at least the last several hundred thousand years.

It is likely that increases in greenhouse gas concentrations are contributing to several significant climate trends that have been observed over most of the western United States during the past 50 years. These trends are: (1) a several day increase in the frost-free growing season, (2) an earlier and warmer spring, (3) earlier flower blooms and tree leaf out for many plant species, (4) an earlier spring snowmelt and run off, and (5) a greater fraction of spring precipitation falling as rain instead of snow.

In Utah, the average temperature during the past decade was higher than observed during any comparable period of the past century and roughly 2^{o}F higher than the 100 year average. Precipitation in our state during the 20th century was unusually high; droughts during other centuries have been more severe, prolonged, and widespread. Declines in low-elevation mountain snowpack have been observed over the past several decades in the Pacific Northwest and California. However, clear and robust long-term snowpack trends have yet to emerge in Utah's mountains.

Climate models estimate an increase in the Earth's average surface temperature of about 0.8°F over the next 20 years. For the next 100 years, the projected increase is between 3 and 7°F, depending on a range of credible estimates of future greenhouse gas emissions. These projections, combined with extensive scientific research on the climate system, indicate that continued warming will take place over the next several decades as a result of prior greenhouse gas emissions. *Ongoing greenhouse gas emissions at or above current levels will further alter the Earth's climate and very likely produce global temperature, sea level, and snow and ice changes greater than those observed during the 20th century.*

What does this mean for Utah? *Utah is projected to warm more than the average for the entire globe and the expected consequences of this warming are fewer frost days, longer*

growing seasons, and more heat waves. Studies of precipitation and runoff over the past several centuries and climate model projections for the next century indicate that *ongoing greenhouse gas emissions at or above current levels will likely result in a decline in Utah's mountain snowpack and the threat of severe and prolonged episodic drought in Utah is real*. Preparation for the future impacts of climate variability and change on Utah requires enhanced monitoring and knowledge of Utah's climate, as well as better understanding of the impacts of weather and climate on the state's water availability, agriculture, industry, and natural resources."

Table 1. Levels of confidence

Terminology	Degree of confidence in being correct
Very high confidence	At least 9 out of 10
High confidence	About 8 out of 10
Medium confidence	About 5 out of 10
Low confidence	About 2 out of 10
Very low confidence	Less than 1 out of 10

Table 2. Likelihood

Terminology	Likelihood of the occurrence/outcome
Virtually certain	Greater than 99%
Very likely	Greater than 90%
Likely	Greater than 66%
About as likely as not	33 to 66%
Very unlikely	Less than 10%
Exceptionally unlikely	Less than 1%

UTAH'S EMISSIONS INVENTORY

BRAC members wanted to ensure that carbon reduction efforts actually targeted Utah's GHG emissions. To identify those emissions, information was taken from Utah's "Final Greenhouse Gas Inventory and Reference Case Projections, 1990-2020." The inventory was prepared by the Center for Climate Strategies and is included in this report at Appendix B.

The inventory identified the following factors of interest:

- Activities in Utah accounted for approximately 69 million metric tons (MMt) of gross carbon dioxide equivalent (CO_2e) emissions in 2005, an amount equal to about 1% of total U.S. gross GHG emissions.[2]

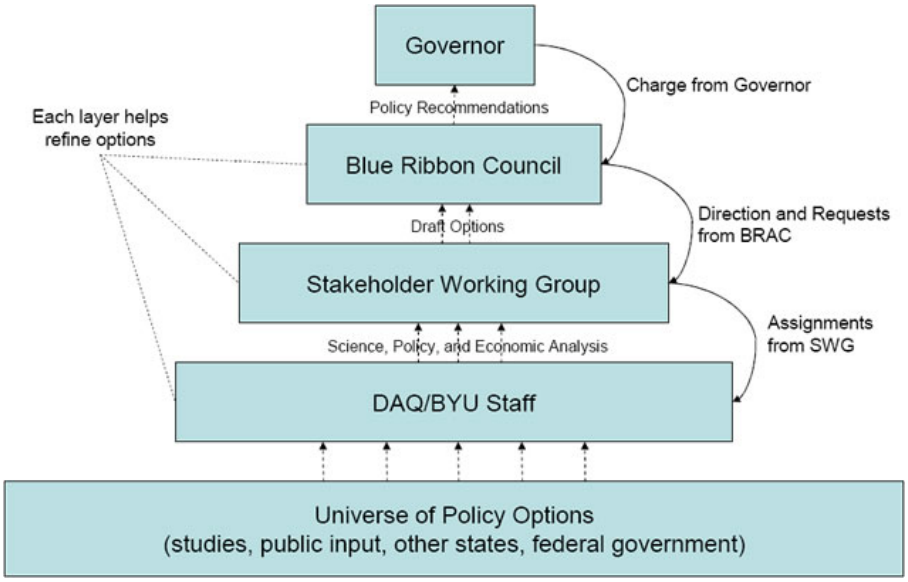
[2] Gross emissions exclude carbon sinks, such as forests, that offset emissions.

- On a per capita basis, Utahns emits about 27 metric tons (Mt) of CO_2e annually, slightly higher than the national average of 25 $MtCO_2e$/yr.
    - Our annual per capita emissions were relatively unchanged during the 1990-2005 period, a pattern that is consistent with the nation as a whole.
- Economic and population growth combine to produce steadily increasing total emissions.
    - Utah's gross GHG emissions are rising at a faster rate than those of the nation as a whole. Statewide, emissions increased 40% from 1990 to 2005.
    - Nationally, emissions rose only 16% during the same period.
- During the 1990s, improvements in energy efficiency resulted in a decline in emissions per unit of gross product (called energy intensity) of 40% nationally, and of 52% in Utah.
- The principal source of Utah's GHG emissions is electricity use[3], accounting for 37% of total State gross GHG emissions in 2005.
    - The next largest contributors are transportation sector (25%) and the residential, commercial, and industrial fossil fuel combustion sector (18%).
- Utah's gross GHG emissions are projected to climb to 96.1 $MMtCO_2e$ per year by 2020, 95% above 1990 levels.
- Approximately 12.3 $MMtCO_2e$ are sequestered annually in Utah forest biomass[4]. There is, however, a significant degree of uncertainty in the size of the forest sink in Utah. This estimate is believed to be at the high end of the possible range of sequestration estimates.

DETERMINING RECOMMENDATIONS

The following chart summarizes the process used by the BRAC to develop recommendations:

[3] Specifically, electricity production netting out electricity exports.
[4] According to data from the U.S. Forest Service for the Final Utah Greenhouse Gas Inventory and Reference Case Projections, 1990-2020. The inventory is summarized in this report and available online, in its entirety at: http://www.deq.utah.gov/BRAC_Climate/docs/Final_Utah_GHG_I&F_Report_080907.pdf



Twenty-four industry, government, community and environmental leaders were invited to participate as BRAC members. To assist the BRAC in meeting Governor Huntsman's directive, a Stakeholder Working Group[5] (SWG) was formed to provide a preliminary evaluation of a broad list of policy options. The initial policy option list was based on suggestions by BRAC and SWG members and options included in reports by the U.S. Environmental Protection Agency and other organizations where stakeholder groups did similar work. Nearly 200 options were organized under five major sectors headings:

- Agriculture/Forestry
- Cross-Cutting Issues
- Energy Supply
- Residential/Commercial/Industrial
- Transportation/Land Use

Working within each sector group, the SWG:

(1) Refined the list of options by consolidating overlapping and related issues; then

(2) Provided an initial evaluation of each option by considering information, where available, on:

- the costs per ton of reducing or avoiding or sequestering CO_2 emissions;
- any associated environmental, economic, and other co-benefits;
- the ease or difficulty with which the option could be implemented;
- its impact on consumers, businesses, and governments; and
- Related political challenges involved in pursuing the option.

[5] See Appendix C for BRAC and SWG members

Each group was co-chaired by two SWG members and participation was open to any SWG or member of the public who had an interest. A running list of meeting times and locations was maintained on the DEQ website. Participants had the option of attending a meeting in person or calling-in via a toll-free number. In the end, over 100 people participated in a total of 52 meetings.

The quick timeframe outlined for completion of the task did not allow for original research or state-specific economic evaluation of each option. BYU research assistants and DEQ staff members gathered existing information on each option from climate reports written for EPA and other States, from the 2000 Utah Office of Energy and Resource Planning Report, and, as a last resort, from credible information sources readily available on the web. This information was augmented by information provided by SWG members and other subject experts who participated in the sector group discussions. Then, within the sector groups, each option was assigned a bin and priority designation.[6]

The sector groups[7] reported the results of their deliberations back to the entire SWG which then considered the information and bin and priority designations. Of the 88 options, only 14 sector designations were challenged. In these cases, a vote was taken of the SWG members present. The option papers and a summary table were then given to the BRAC for its consideration. The BRAC added three more options and then finalized priorities.

The BRAC, SWG members, and sector group participants have invested an enormous amount of work in discussing and assessing these options. Their discussions have been exhaustive, thorough, thoughtful, spirited, and congenial.

The meetings of the BRAC and SWG were open to the public and information from meetings and presentations was posted on the website at http://www.deq.utah.gov/Issues/Climate_Change/index.htm . Questions and comments were accepted from the public throughout the process. Written public comments have been posted at the end of each sector chapter in this report.

The assumption guiding this process is that there was only time to identify a wide range of options, organize and consolidate the options into a manageable list, provide a brief assessment, and then make an initial effort to rank and prioritize them. Both the BRAC and SWG felt it was important to offer a variety of options and an economy-wide approach. To the extent possible, they commented on the costs and benefits of implementing various strategies. The options papers contain notes from the comments made by sector group members during their working meetings, comments made at the final meeting of the SWG to which all members agreed, and comments made by BRAC members. The option papers also include information on the cost per ton of CO_2 avoided or reduced that was obtained from analyses used by other western states. That information was typically quite cryptic and rarely included detailed explanation.

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[6] See Section III, Final Summary of Options, for definitions used to determine bin and priority designations

[7] See Appendix C for list of participants in sector discussions.

However, it gives some idea of the range of costs that might be relevant in Utah. Future, Utah-specific economic cost benefit analyses must be completed on policy recommendations where appropriate. The BRAC acknowledges that while there may be costs and benefits associated with the policy recommendations in this report, any economic analyses conducted must also take into account the potential costs associated with inaction. Both may need to be considered. Finally, any process followed from this point on should include stakeholder involvement.

SUMMARY OF RECOMMENDATIONS

The BRAC recommends that the Governor and the legislature consider the following options to reduce greenhouse gas emissions in Utah.

High Priority Options

Agriculture/Forestry

- Preserve open space/agricultural land
- Protect forest land by reduced conversion to non-forest land
- Promote the production of biomass fuels
- Increasing forest health risk reduction programs
- Increase fire management and risk reduction programs
- Promoting urban and community trees

Cross-Cutting Issues

- GHG registry
- GHG reduction targets
- Regional/state cap and trade program, carbon tax, or hybrid
- Research and development into low/no carbon energy strategies
- Public education and outreach
- Climate adaptation strategies and policies
- Guidelines for climate policy and coordinate with other policies
- Evaluate existing climate proposals at the regional, federal, and international levels
- Bridging strategies to achieve low-carbon economy

Energy Supply

- Develop significant amounts of renewable energy resources
    - Renewable portfolio standard
    - Creation of energy development zones
    - Green power purchases and marketing
    - Public benefit charge
    - Tax credits and incentives for renewable energy
    - Pricing and metering strategies
    - Research and development

- Encourage carbon capture and sequestration technology
    - CO_2 capture and sequestration policy
    - Issues for CO_2 transmission
    - Research and development
- Develop and deploy advanced generation technology
    - Incentives for Advanced Fossil Fuel Technologies that Yield Carbon Reduction Benefits
- Improve efficiency and reduce CO_2 at existing electricity generation plants through
    - Generation or emissions performance standards
    - Efficiency improvements
    - Retrofit plants with CO_2 capture
    - Retire old plant: building new, low-carbon Greenfield plants
- Promote combined heat and power distributed generation using incentives and removing institutional and other barriers
    - Incentives and barrier reductions for CHP and DG
- Improve efficiency of electric transmission and distribution systems by
    - Remove transmission/distribution system limitations and other infrastructure barriers for renewables and other clean distributed generation
    - Transmission system upgrading
- Miscellaneous energy supply options
    - Research and development
    - Remove regulatory barriers
    - Tax credits and incentives

Residential/Commercial/Industrial

- Utility demand side management
- Voluntary efficiency targets
- Rate design
- Government leading by example with mandatory efficiency targets
- Distributed generation with combined heat and power systems
- Distributed generation with renewable energy applications
- State appliance efficiency standards
- State promotion and tax or other incentives for efficient products
- Focus on small and medium enterprises
- Incentives for improved design and construction (Energy Star, LEED, green buildings)
- Improved building codes
- Waste/recycling

Transportation/Land Use

- Develop and implement aggressive mass transit strategy
- Quality growth programs
- Trip reduction, rideshare, vanpool, telecommuting

- Clean Car program
- Idle reduction program
- Vehicle speed reduction
- State fleet lead by example
- Promote low-carbon fuels and vehicle technologies
- Education programs
- Explore funding options for suite of transportation and land use options

Medium Priority Options

Agriculture/Forestry

- Improve manure management
- Change livestock feed and improve productivity to reduce methane emissions
- Expand use of forest biomass feedstocks for energy production

Energy Supply

- Develop and deploy Advanced Generation Technology
    - Landfill gas/waste to energy that yields carbon reduction benefits
    - Nuclear development

Residential Commercial Industrial

- Green power purchasing
- Solar hot water and photovoltaic codes for new buildings
- Energy management training and training of building operators
- Fuel switching to less carbon-intensive fuels
- Reinvestment fund
- Participate in voluntary industry-government partnerships
- Implement water pumping, treatment, and use efficiency

Transportation/Land Use

- "Buy Local" program
- Develop congestion pricing programs