IBM Real Estate Strategy and Operations
6300 Diagonal Hwy
Boulder, CO 80301

The following narrative is being submitted in accordance with the Boulder Building Performance Ordinance (Ordinance No. 8071), Section 10-7.7-8. – Large Industrial Campus.

ISO 14001 and ISO 50001 Certified

IBM has a long history of driving energy conservation and sustainability through all parts of its business and has been recognized by numerous outside organizations for achieving significant results. Most recently we received the 2018 Climate Leadership Goal Achievement Award for Excellence in Greenhouse Gas Management. This award is presented by the Center for Climate and Energy Solutions (C2ES) and the Climate Registry, in partnership with Bloomberg Philanthropies. This is the second time IBM has been recognized with an award in the Goal Achievement category and the sixth time we have won a Climate Leadership Award in the Award's seven-year history. The Excellence in Greenhouse Gas (GHG) -- Goal Achievement award recognizes organizations that publicly report and verify organization-wide GHG inventories and achieve publicly-set aggressive GHG emissions reduction goals.

IBM's Global Energy Management Program is integrated within its global Environmental Management System (EMS). IBM takes pride in its world class Global Energy Management Program and regards responsible energy management and investments in energy efficiency as part of its corporate mission. IBM has maintained a single global registration against the ISO 14001 EMS standard since 1997. In 2012, IBM successfully certified its Global EMS against the ISO 50001 standard on Energy Management. Under IBM's global registration, the company's largest sites - including the Boulder location - have achieved certification against the ISO 50001 standard. The ISO 50001 standard is one of the most rigorous energy management process certifications, requiring companies to have documented and managed energy management processes, understand their significant energy uses and maintain and execute a commitment to effective energy management across the organization and its operations.

IBM's Corporate Environmental Policy (Policy) calls for the responsible use of energy throughout its entire business, including conserving energy, improving energy efficiency, and giving preference to renewable over non-renewable energy sources where it makes business sense.

IBM's Energy Goals & Objectives

ISO 50001 requires the organization to create and maintain a set of "Energy Objectives, Energy Targets, and Energy Management Action Plans." IBM has maintained a corporate-wide goal of achieving annual energy conservation savings since 1996. The current target is to achieve annual energy conservation savings equal to 3.5% of IBM's total energy consumption. IBM Boulder maintains a very aggressive local energy goal of achieving 4% energy conservation year-on-year, which is in excess of the corporate-level goal. IBM's Boulder campus achieved this ambitious goal in 2018 and is on track to do the same in 2019.

In March, 2015 IBM announced two updated company-wide goals: (1) to procure 20% of its annual electricity consumption from renewable sources by 2020, and (2) to reduce carbon dioxide emissions associated with energy consumption by 35% by year-end 2020 using 2005 as a baseline. IBM proudly achieved both of these goals, four years early, by year end 2016 and continued to meet the goals in 2017. Next generation goals are under development. IBM Boulder has also worked in close collaboration with its local electric utility, Xcel Energy, to analyze potential partnerships and on-site renewable options that will help IBM achieve its energy goals.

Data Analytics Driven Energy Management – IBM's Transformation

IBM formalized its energy conservation and management program in 1974 and has continually improved the program since that time. In recent years, IBM has seen the source of its energy savings shift from traditional

industry best practices (e.g. installing variable speed drives on motors, lighting and lighting control upgrades, HVAC retro-commissioning) to savings that leverage data analytics and cognitive computing-enabled optimization.

IBM's Boulder campus uses IBM's advanced data analytics and facilities management solutions to continuously monitor hundreds of air handling units and other equipment for failed controls that may be wasting energy. Often called Fault Detection and Diagnostics (FDD), or monitoring-based commissioning (MBCx), this technology has been fruitful at IBM's Boulder campus as well as at many clients' locations for identifying opportunities to improve operational energy efficiency and reduce energy use and associated greenhouse gas emissions.

IBM's Boulder campus uses chilled water plants to cool its data center space and buildings. In 2018, IBM Boulder achieved significant energy savings from optimizing its chilled water plants. Colorado's arid climate is uniquely suited for evaporative cooling, and the IBM Boulder site engineering team works continually to maximize the amount of "free" evaporative cooling that can be derived from its chilled water plants. In late 2017, IBM's Boulder campus doubled the capacity of heat exchangers that enable free cooling in our largest chilled water plant in Boulder. The impact of this was seen throughout 2018. IBM also uses third-party optimization tools to ensure the chilled water plant's pressures, flows, temperatures, and equipment staging function at optimal efficiency at all times.

In terms of IBM's data center IT loads, IBM's Boulder campus uses data-driven solutions to manage energy consumption. IBM's largest source of savings in data centers has been server consolidation, where the work load from individual servers is consolidated onto a single server or mainframe like an IBM System Z and Power System servers. By consolidating hundreds of individual servers onto a single machine, this results in more efficient computing and less heat for IBM's chilled water plants to process. Additionally, IBM has installed thousands of temperature sensors in its data centers, and is using sophisticated cooling optimization tools that use the data from these sensors to make equipment staging decision based on machine learning. In some cases these tools are reducing the fan energy necessary in our data centers by 40-50%.

On-Site Renewables
In 2017 IBM Boulder submitted a bid to Xcel Energy's Solar*Rewards program. Under this program IBM offered a price at which we were willing to sell the Renewable Energy Credits (RECs) from an IBM on-site array back to Xcel. IBM and NextEra Energy Resources teamed to compete against more than a dozen other projects and were awarded the entire 6 megawatt release as our bid REC price was the lowest offered. In addition, IBM plans to install an additional 4 megawatts of solar independent of the Solar*Rewards program. This brings the total IBM Boulder solar array size to 10 megawatts. IBM plans to install the array in a field on the east side of the Boulder site. Construction will begin near the end of 2018 and be complete by July 2019. Vegetation around the array will be managed primarily by grazing sheep.

In Conclusion
IBM takes environmental stewardship seriously, maintaining a local focus with a global perspective. More detail on IBM's environmental programs can be found in the IBM Environmental web pages and the IBM and Environment Annual Report.