Hi Russ,

Earlier, I entered my opinions about the climate plan draft but more recently have refined my thinking a bit, so here are a couple restated suggestions about auditing:

I think it would be good to hear about how the departments that put the plan into action do auditing and consider making those audits very robust. They could be done in various ways and by various audit teams on a rotating schedule. The audits can be internal and some can be from various outside groups such as Saint Paul 350, professional auditors, high-tech industries with trained audit staff such as ECO Lab, an adhoc group of concerned and willing citizens of Saint Paul,... Having various groups involved will bring fresh eyes and ensure that the plan is effective. Audits should promptly be followed up with robust corrective action plans.

Another audit method could be ongoing, real-time monitoring of Saint Paul's CO2 emissions displayed, like a scoreboard, in public places and on apps, comparing the actual emissions to the target emissions. The CO2 'score' would be followed up promptly with predesigned corrective actions if the values exceed predetermined limits. These corrective actions would be robust actions that would immediately drop emissions by a calculated amout commensurate to the excessive CO2, such as closing off the downtown to motor vehicles for a period of time. They should be designed to minimize negative effects on vulnerable populations and minimize negative effects on our economy.

Thanks for your work on our behalf!

Peter Truitt
1597 Charles Ave Apt L
Saint Paul, MN 55104
…and…
6720 Hayden Lake Road
Danbury, WI 54830

651-249-4491

"The test of a morality of a society is what it does for its children." – Deitrich Bonhoffer

Dear Russ (if I may),

My name is James Doyle and I have lived and worked in St. Paul for 27 years. I am writing to comment on the St. Paul Climate and Resiliency Plan.

There are many things I really like about the CARP. The strategies outlined and the broad themes in the draft indicate a sincere attempt to confront the reality of climate change. I am proud to be a resident of a city that takes the climate challenge seriously. I am especially pleased with the emphasis on resiliency in the more economically stressed parts of town. However, there are some aspects of the CARP which I think need more consideration. Although I recognize there are many necessary facets to this plan I will focus my comments on renewable energy generation. In particular, I want to strongly advocate that the City of St. Paul use its influence as a major customer of Xcel energy to directly engage with the utility in furtherance of the stated goals of the CARP.

The plan advocates for increased distributed solar, that is, residential, commercial, and solar garden systems (pp 29, 31, and especially pg 37). I think we agree that there are real benefits of distributed solar. These include reduction rate payer's electricity bill, reduction in the energy lost in long-distance transmission, avoided capital investments by utilities, avoidance of the volatility of gas prices, decentralization of the grid which can increase local reliability of electricity, the fact that rooftop solar is faster to implement (months) than utility scale solar (years), and the empowering of residents with the democratization of energy. Indeed, studies have shown that when all of the benefits are taken into account (grid, societal, and environmental), on average the value of solar exceeds the retail rate of electricity, resulting in a net monetary benefit to society [1]. CARP appears to be a strong advocate of distributed solar, a position with which I wholeheartedly agree. The commitment to 350 MW of commercial and residential rooftop solar in the plan (pages 50 and 51) is a significant fraction of the 800 MW of rooftop solar possible in St. Paul (pg 37).

However, one major concern that I have is the timeline proposed for the rooftop solar. According to the CARP, out of the full 350 MW only 180 MW will be installed by 2040 (pp 50-51). Solar technology is essentially fully mature, and as I am sure you are aware the IPCC has given us only about a decade for aggressive action on carbon emissions to avoid the worst effects of climate change. I would strongly recommend a much shorter time scale for the rooftop solar implementation. For example, why not 350 MW (or more!) by 2035? Of course I understand that the actual capacity possible at any given time is dependent on economic (and potentially policy) factors, but such factors are increasingly favorable and I see no reason why we cannot now commit to a much shorter timeline.

St. Paul also should commit to supporting community solar gardens, which have enjoyed very rapid growth in recent years [2] and can provide solar power options for those whose roof configuration and/or environment are unsuitable for solar panels. CARP does advocate incentivizing community solar gardens (for example on pg 51) and mentions hosting community solar gardens [pg 48] but does not provide any details on how the city would actually do this (discussed further below).

It is clear from the CARP that the city is relying heavily on the Xcel Integrated Resource Plan for action on renewable energy generation in the coming decades. But the IRP includes only 441 MW of distributed solar through 2034 throughout the entire upper midwest region in its preferred plan [3], with no commitment to distributed solar beyond that date. This figure also includes all community solar gardens, i.e. all non-utility scale installations. Xcel clearly wants the focus to be on utility scale solar, proposing 4000 MW by 2034. While this is certainly a positive development with regard to decarbonization of our energy, utility scale solar does not provide the benefits of distributed solar discussed above. There is no reason why we shouldn't have an abundance of both utility and distributed solar. Utilities have in general been pushing back on distributed solar claiming that net metering rules raises costs for all customers; for a refutation of these claims see [1] and [2]. Xcel itself has been lobbying against community solar gardens at the legislative level [4].

I think it is imperative that the city use its influence as a major customer of Xcel to engage in the IRP process and insist that the utility support a much more ambitious distributed solar portfolio. There is clearly a precedent for engaging Xcel to support municipal sustainability goals; of course I am referring to the Minneapolis Clean Energy Partnership. St. Paul should take a similar approach. With a population 73% of that of Minneapolis, we should carry nearly as much clout with Xcel as our sister city. Furthermore, the possibility of a municipal utility should also be on the table if Xcel will not accommodate the climate and resilience goals of our city.

In addition, consistent with social justice goals of the CARP, we need to add distributed solar in ways that create access for lower income households that cannot afford the up-front cost of installing panels. I was glad to see that CARP emphasizes the need for low-income access to renewable energy (pg 48). While not mentioned in CARP, inclusive financing is a proven mechanism for providing such access [5]. Although it is true that most inclusive financing has been through electric cooperatives, there is no fundamental reason why for-profit utilities cannot adopt this practice. Again, St. Paul should use its influence as a major Xcel customer to insist that the utility provide options for low-income customers to finance residential solar installations and remove barriers to participation in community solar gardens so that all residents have the opportunity to reap the financial benefits of solar electricity.

There is yet a further reason for St. Paul to engage Xcel as one of the company's major customers. One of the most troubling proposals in the IRP is the plan to buy the Mankato Energy Center natural gas power plant. There is much opposition to this proposal. According to media reports the state attorney general's office, the Minnesota Department of Commerce, large industrial users, clean energy advocates, and the city of Minneapolis all oppose this purchase [6]. Xcel has also managed to obtain approval to construct a new natural gas plant in Becker outside the IRP process. Committing the state to several decades of major fossil fuel infrastructure at a time when renewable energy and energy storage are rapidly expanding in deployment and dropping in price is contrary to both the spirit and specific goals of the CARP. Solar and wind with grid energy storage are viable alternatives to natural gas, and large capacity storage projects are starting to appear all over the country [7,8,9]. There is no battery storage (the most likely storage technology) included in the preferred plan of the IRP [10]. I was happy to see that the CARP mentions energy storage in several places (pp 31, 47, 58), but the city needs to use its influence to pressure Xcel to take leadership in adopting these technologies.

Thank you for reading this. I appreciate that your job here is not an easy one, and you need to engage and satisfy different constituencies, and deal with budgetary constraints and uncertain future economics. I also recognize that the issues discussed above are complex and solutions will take some work. But climate change is an existential threat, and (as emphasized in the CARP) it is a social justice issue as much as an environmental issue. Bold and decisive action is needed right now, not in 20 or 30 years. St. Paul can and should be a national leader in the efforts to eliminate atmospheric carbon emissions in an equitable way and safeguard the future for future generations. The CARP draft is definitely a step in the right direction, but I believe we can and should push harder. In particular, I firmly believe that direct engagement between St. Paul and Xcel will be necessary to achieve the CARP's goals.

[1] https://environmentamerica.org/reports/ame/shining-rewards

[2] https://ilsr.org/minnesotas-community-solar-program/

[3]Upper Midwest Integrated Resource Plan 2020-2034, pg. 72.

[4] https://www.mprnews.org/story/2019/03/01/xcel-to-state-community-solar-programs-needs-overhaul

[5] https://ilsr.org/report-inclusive-energy-financing/#Executive

[6] https://energynews.us/2019/03/27/midwest/on-its-way-to-carbon-free-power-xcel-wants-to-buy-a-natural-gas-plant/

[7] https://solarindustrymag.com/quinbrook-secures-off-taker-for-giant-gemini-solar-storage-project

[8] http://newsroom.fpl.com/2019-03-28-FPL-announces-plan-to-build-the-worlds-largest-solar-powered-battery-and-drive-accelerated-retirement-of-fossil-fuel-generation

[9] https://www.tdworld.com/energy-storage/us-become-world-s-largest-grid-connected-energy-storage-market

[10] Upper Midwest Integrated Resource Plan 2020-2034, pg. 121. They state battery storage "would be considered to fill any firm dispatchable needs" which would start in 2029, but this is hardly a commitment to storage, since firm dispatchable generation could be anything from batteries to natural gas fired plants.

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James R. Doyle
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Regarding the "Low-income community solar garden at Dayton's Bluff" listed as an existing residential resource on pg. 48, this CSG has not been built as of July 2019. Thank you for providing the (unfortunate) information about the developer Thor Construction. I spoke with Patsy Noble, Executive Director of Urban Roots, whose organization (along with Jim Erchul) is a community partner in the project. She said that in addition to the problems with Thor, Xcel is unlikely to pursue the project because there is not enough space to make the CSG financially viable at that location. She said that community members, including the students she works with, are disappointed and would still like to see solar energy on the East Side.

Our St. Paul 350 team has been working on locations for community solar gardens within St. Paul City limits, and we have identified 10 St. Paul Public Schools that have rooftops large enough to support CSGs that would provide affordable renewable energy to diverse communities including low income renters. We would love to see an East Side school, such as Harding or Johnson, be the first Community Solar Garden in the city of St. Paul.

Although we've been struggling to get traction with SPPS decision makers on this proposal, we have received much interest and enthusiasm for the idea from students, members of the community, city council, and school board. For example, a resolution we circulated at precinct caucuses in support of cooperatively-owned community solar gardens on St. Paul Public Schools passed with more than 70% support from delegates at the DFL City Convention last week.

We ask that this community-led effort to make renewable energy accessible and affordable to East Side residents would be included in St. Paul's Climate Action and Resilience Plan as a Key Action in the Municipal Leadership section (pg. 59), especially since plans for the the CSG in Dayton's Bluff (pg. 48) have fallen through. This opportunity to engage East Side students in climate action and resilience fulfills the goals of the City Convention Resolution passed by delegates and, more importantly, the St. Paul Climate Inheritance Resolution presented by iMatter Youth and passed by the City Council.

Sincerely,

Chelsea DeArmond

St. Paul 350

Dear Mr Stark,

Interfaith Creation Care-St. Paul, representing several faith communities and serving as an extension of MN Interfaith Power and Light, thanks you and your team for the thoroughness of the draft St. Paul Climate Action and Resiliency Plan. The objectives are clear and we were honored to host two community meetings with you during May (May 11 at the University of St. Thomas and May 20 at First Lutheran Church). We fully support the need for climate action as presented in the plan and we commit to continuing to organize within our faith communities and the larger MNIPL network to build political will and grassroots action to help realize this vision for the city we call home.

We are also working in partnership with 350 St. Paul and want to add our support for their comprehensive response which I understand you received earlier this week.

As an interfaith team, we would particularly highlight our support for the plan's focus on energy equity. In addition, we would emphasize our concern that the largest gap we see in the draft CARP to be the reliance on Xcel Energy and the continuing growth of burning natural gas. Along with more explicit support for residential solar we would also like to see more on how the city of St. Paul is going to help homes and businesses electrify their heating systems and kitchens.

The climate resiliency plan also needs specific plans on how the City of St. Paul's plan to reduce food waste and increase local food production. To improve the health and vitality St. Paul we would like to see more natural infrastructure, an increase in regenerative urban agriculture, and improved food recovery and donation programs.

To make all of this happen St. Paul needs to promote the composting of all types of organic material and develop an efficient way of cycling all of these nutrients back to the soil we depend on to grow food and support a vibrant city ecology that sequesters carbon and supports bilogical diversity. We agree with St.

Paul 350 in that Urban agriculture is an area where diverse grassroots organizations are leading St. Paul in the right direction and urge the city to resource and partner with this promising movement.

Please consider these in your revision and thanks for all your work. We look forward to continuing to work with you in the coming months and years to make this vision a reality.

Interfaith Creation Care - St. Paul 's Climate Team
Cathy Velaquez Eberhart, Teresa Borzcik, Lorraine Delehanty, Trudy Dunham, and Michael Stoick

Street Address: 1316 West Seminary Avenue
City: Saint Paul
State: Minnesota
Zip Code: 55104
E-mail Address: takugler@gmail.com
Daytime Phone: 6122748022
Alternate Phone:

==Message Details==
Subject: The Climate Crisis - Fear, Love, and Hope
Your Comment:
Dear Mayor Carter,

I am writing to share a message I gave as part of the Integrity of Creation Service at St. Paul's United Church of Christ this past April. The message conveys my fears and hopes surrounding the climate crisis, both of which are bound up in deep love for my family and my community. I am sharing this message with you because the climate crisis is so all-encompassing. It is not just an environmental issue, a scientific issue, or an economic issue. It is ultimately a moral issue, tied directly to living in a right relationship with all life on earth. As such, it requires a response drawing on deep convictions and touching all aspects of our lives.

I hope that you will take this message to heart, and that you will reflect on the climate crisis, and the many related crises all rooted in the destructive nature of our industrial/consumer society, throughout all of your deliberations and decisions. It is important to recognize that local actions are perhaps the most vital of all. We must work within our neighborhoods to build resilient communities. That includes practical elements like bike lanes, effective and accessible transit, land use regulations that promote walkability, and curbside composting. It also includes strengthening relationships and trust within the

community.

I have been encouraged by your attention to these issues and steps you have taken, such as appointing a Chief Sustainability Officer and working toward 100% renewable energy goals. I encourage you to continue this work, to increase the priority and urgency of it, and recognize and acknowledge the depth of systemic change required.

The Climate Crisis - Fear, Love, and Hope
Message for Integrity of Creation service
April 28, 2019
St. Paul's United Church of Christ

As many of you know, I have two daughters. Daphne is eight and is in third grade. She loves sushi and is perpetually halfway through making up a board game. Iris is five and in pre-K. She's a puzzle whiz and a fearless gymnast. Lately, both girls have been talking about what they want to be when they grow up. Iris's current thought is a veterinarian. Daphne has reached a point of eight-year-old wisdom, realizing it's really hard to pick just one thing and wonders how often she can change jobs. Like any mom, I love these two girls more than anything. I see what incredible potential they have to be amazing human beings. And I want them to be able to follow their dreams as they grow up.

But I know, and more and more I feel, that they will be growing up in an intensely challenging world. I'm sure you remember February (unless you're trying to forget it). We were battered with our snowiest February on record. 39 inches, with several inches falling every few days. One Sunday night in the middle of the month I made the mistake of checking the forecast for the coming week before going to bed. I had already shoveled several times that week, and the week before. And the forecast called for more snow on Tuesday, and yet again on Thursday. In that moment, I felt a rising sense of panic. Initially for the week ahead and how to fit another several hours of shoveling our 110-foot long driveway into my busy schedule.

But the largest weight was knowing that this is just the beginning of increasingly unsettled weather. That disrupted cycles of precipitation - too much all at once, or too little for too long - are becoming the norm not just here, but all around the world. Seasonal transitions are wavering, coming earlier or later, and with less predictability, wreaking havoc for migrating animals and for farmers.

As the disruptions intensify, they will have consequences for food and water supplies, for disease and health, and ultimately for the fabric of human society. And this is the world in which my daughters are going to spend their entire lives. I wonder whether Iris's dreams of becoming a veterinarian, or Daphne's quest to thrive at whatever it is she decides on will even be possible in the kind of world that is coming.

At this point, I was going to walk through some of the data illustrating the severity of climate change. My day job revolves around data and I am very comfortable with it. But I decided that now is not the time for comfort, on many levels.

You'll find the chart I was planning to use [at

https://drive.google.com/file/d/1OLp8lUG1JVzIQtcpXAPOv_QTIyszfHTT/view?usp=sharing].

To summarize the main points: Relatively stable temperatures have prevailed for the past 10,000 years, throughout the history of human agriculture. Until now. The change in global average temperature resulting from human-caused climate change is expected to be similar in magnitude to the difference between the last ice age and that stable level.

And that change is happening over a mere 100 years, not gradually over thousands of years. That severe and abrupt change will disrupt the earth's physical and ecological systems in ways we cannot predict, or maybe even imagine.

This is undeniably scary stuff, as we begin to feel the possibility of literal truth in the prophetic words from Isaiah. "The world languishes and withers; the heavens languish together with the earth. The earth lies polluted...and a curse devours the earth." So I want to spend a few moments talking about fear, love, and desperate, but no less real, hope.

Climate change - which some are now calling climate chaos - is hard to think about. It is very human to turn away, to allow ourselves to be distracted by what can seem like more urgent priorities. There's actually a whole book about why we are so good at NOT thinking about climate change. We all know it's happening. We know it's a big problem. But I suspect that most of us have not fully, deeply considered what it means.

Until a couple of years ago, that's where I was. I had bought a copy of Naomi Klein's This Changes Everything and started reading it. But it took me months to really dig in. Because, at a certain level, I was afraid to. I wanted to stay in my comfort

zone. I didn't want to follow the implications of climate chaos to their conclusions. I didn't want to look too closely at this big, messy problem that is bound up in every single aspect of our way of life. Eventually, I worked up the courage to keep reading. And it was scary. It was terrifying. But Klein also makes the case that changing everything is not necessarily a bad thing.

That's the same case made by the Transition Movement. If you've been around here for the past several months, you have probably heard at least some hints about Transition. Transition empowers individual communities to come together on a very practical level to transform themselves into the locally-oriented, relationship-based, fossil fuel free, resilient communities we need.

For me, and for many others, Transition resonates strongly with the teachings of Jesus and the three great loves that the broader UCC emphasizes - love of neighbor, love of children, and love of creation. But, for me at least, this is not a safe, tame love. It is not a love that settles for appreciating a walk in the woods or bringing a meal to a neighbor in need - though it absolutely does those things too. But it is more than that. It is a fierce love. Love that wraps itself tightly around the grief and pain of every beloved being and every sacred place that is destroyed by our way of life. It is the anguished love of a mother for her ailing child, cherishing every good and precious moment of beauty that is here, now. The kind of love that drew Jesus' followers to huddle together in the dark days following that first Good Friday, when Easter was not a foregone certainty. Love that fights every day to protect my children's future.

The Transition Movement speaks to me because it taps into this fierce, desperate, gathering love. Transition is ultimately about relationships, joy, and hope. Relationships are central to meeting our needs locally, in low-energy, community-based ways, freeing ourselves from the vast fossil-fueled consumer economy. Strong relationships will be necessary to weather the coming challenges of our changing planet. Nurturing these relationships between neighbors and with our home places also inspires great joy. Authentic joy that is not available in stores. And working together, we also find hope.

Action is a great antidote to despair. As you heard in the time with children and will hear more from Laura, choices we make every day regarding food can help both lessen the damage to our climate and build relationships. I also hope that you will consider joining us as we dig deeper into the Transition Movement in a Common Ground group over the next couple of months and a

Transition-based book study this summer. Rob Hopkins, the founder of the Transition Movement, has said, “If we wait for the governments, it’ll be too little, too late; if we act as individuals, it’ll be too little; but if we act as communities, it might just be enough, just in time.” I hope - I pray - that he is right.

The results of this submission may be viewed at:
https://www.stpaul.gov/node/118466/submission/250786

Dear Russ,

Overall we strongly support the Climate Action and Resilience Plan, but have three suggestions.

Suggestions

1. In the Waste Management section, we suggest the plan go beyond placing a fee on disposable shopping bags and requiring “to go” packaging containers to be recyclable or compostable. Instead we suggest the plan ban plastic shopping bags and single-use plastic packaging. We also suggest that shipping packages such as Amazon boxes must be taken back by the shipper.

2. Because noise is a fast growing threat to the health and resilience of our city, a section on Noise should be added to the plan. Saint Paul should set decibel limits for equipment, motorcycle, cars, trucks and trains and work-time limits for outside construction and maintenance in neighborhoods. For example

- yard maintenance equipment such as leaf blowers, power mowers and edgers should have decibel limits.
- Back up beeps for trucks should be set so they cannot be heard two, three and four blocks away.
- Car alarms should also be set on the quietest setting.
- Trains should not be allowed to idle at frequencies that vibrate throughout neighborhoods.
- Motorcycles should be required to have mufflers.
- Outside construction and maintenance in neighborhoods should be limited to hours between 8a.m. - 7p.m.

3. The amount of green space such as parks and play areas should be maintained and not converted to parking lots, buildings and other impermeable surfaces. Specifically, the Hillcrest Golf Club and Highland Park 9-Hole Golf Course should be preserved as green space.

We hope this plan will be fully implemented without exceptions and variances.

Sincerely,
Debbie Meister and Gene Christenson

1312 Portland Avenue

Saint Paul, MN 55104

-----Original Message-----
From: webmaster@ci.stpaul.mn.us <webmaster@ci.stpaul.mn.us>
Sent: Tuesday, June 4, 2019 2:28 PM
To: *CI-StPaul_Mayor <Mayor@ci.stpaul.mn.us>
Subject: Form submission from: Contact the Mayor

Submitted on Tuesday, June 4, 2019 - 14:28 Submitted by anonymous user: 75.168.115.227 Submitted values are:

==Personal Information==
Name: Anna Fryxell
Organization / Business:
Street Address: 1335 Keston St
City: St. Paul
State: Minnesota
Zip Code: 55108
E-mail Address: afryxell001@gmail.com
Daytime Phone: 6519001855
Alternate Phone:

==Message Details==
Subject: renewable energy
Your Comment:
Hello,

I wanted to express how excited I am that St. Paul has recently committed to 100% renewable electricity energy community-wide by the year 2030. I also wanted to ask if the city has plans to broaden this commitment so that it includes energy forms besides electricity and businesses as well as communities? If so, I would definitely support that.

Thank you,
Anna

Mr. Stark,

As part of the Climate Action and Resilience plan I hope the city will consider banning gas powered leaf blowers. This has been done in many cites across the country and not only would improve air pollution, but noise pollution as well.

I look forward to a response from your office as to your thoughts on including this ban in our city.

Thank you,
Jane Amberg
201 Woodlawn Ave.

Dear Mr. Stark – The St. Paul CLIMATE ACTION &RESILIENCE DRAFT PLAN is impressive and promising in its broad scope and depth of analysis. You and your team have done an excellent job of addressing very complex adjustments our city must make in recognition of our challenging energy and environmental futures.

As I read through the plan there were some points (below) that I didn't see but may have missed. I made a list of a few things that might be helpful. Thanks for all your efforts – much appreciated. BDS

1) Energy sourcing and efficiency
    a. Renewable energy options such as Savers Switch and Windsource are not widely known. Can the City help publicize these and similar programs?
    b. Analyze commercial energy use for opportunities to reduce demand.
    c. Transition to EV fleets but recognize reduced effectiveness of batteries in cold weather.
    d. Early elimination of natural gas (methane) as a 'low carbon' transition fuel in recognition that 5-10% of product is lost in extraction and transport of product. Discourage new fossil fuel infrastructure projects.

2) Travel-transportation –
    a. Adopt City policy of no travel for meetings. Use best available video-conferencing systems
    b. City to purchase or develop carbon offsets for unavoidable air travel; assign costs to specific department(s)
    c. Enforce speed limits
    d. Develop and enforce no idling policy for trucks, buses to reduce pollution and emissions
    e. Enhance safety and access to bike lanes/trails with improved signage
    f. Help Met Council institute solar and distributed generation for light rail to maintain during area power outages

3) Waste reduction/plastic management
    a. Recognize collapse of plastic recycling market
    b. Recognize that despite multiple cycles of repurposing, plastics remain a permanent toxic residual in the environment
    c. Packaging control to include commercial packing/shipping
    d. Ban single use plastic beverage bottles in all city operations
    e. Ban non-recyclable black plastics in containers

e. Better more convenient compost options – one option might be to collect compost at farmer's markets
f. Encourage glass vs plastic product containers

4) Buildings and housing
   a. Resilience issue – buildings' plumbing and electrical connections and generators are in basements or lowest levels where flood risk is greatest.
   b. Pollution issue - HVAC intakes at ground level pull in more pollution especially from idling vehicles
   c. Explore substitutes for plastic based building materials – ROI's
   d. Explore possibilities for reduced concrete use
   e. Reforest all suitable areas of city with clearer responsibility for care of young trees

5) Health and well-being
   a. Evacuation/transportation plans for low income neighborhoods, prisons, homeless. Plans should recognize special challenges in heat waves (cars overheating; buckling roadways; loss of water pressure as hydrants are opened; brown-outs, etc
   b. Heat wave planning should focus on isolated elderly/disabled
   c. wellness checks in vulnerable areas after severe storms
   d. Review health care facility emergency plans including hospitals, clinics, pharmacies and chronic care facilities
   e. Develop plans to maintain availability of electronic health records, pharmacy services and patient evacuations during extreme climate events
   f. Provisions to ensure ethnic minority communities understand and have access to plans and emergency warnings.
   g. Institute comprehensive heat wave and storm shelter plans for vulnerable communities, mobile home parks, etc.

Bruce D Snyder MD FAAN
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NOTES ON

CITY OF SAINT PAUL CLIMATE ACTION AND RESILIENCE DRAFT PLAN

POTENTIAL CO-BENEFITS OF CLIMATE MITIGATION AND ADAPTATION

Climate change mitigation and resilience are different aims. One seeks to reduce the severity of climate change while the other aims to improve abilities to cope with climate change. But occasionally the two overlap and these special opportunities should be capitalized on. Encouraging or even stipulating that large commercial, institutional and industrial rooftops be white when new buildings are constructed or when existing buildings are reroofed is one example. White roofs can reduce air conditioning loads and therefore energy consumption in summer (and conversely do not increase heating needs in winter) while also helping to ameliorate the intensity of summer urban heat islands.

DISTRICT HEATING AND COOLING

The city is home to one of the most highly regarded energy management and design businesses in the nation. Ever-Green Energy is a tremendous asset. Owners and operators of commercial, industrial and institutional building clusters should be encouraged to use Ever-Green Energy's expertise to dramatically improve the energy performance of their campuses.

WHAT CAUSES CLIMATE CHANGE? P. 12

The current text reads, *"These gases rise into the atmosphere where they can stay for thousands of years, trapping heat as it bounces off of the earth's surface."* This is not quite right. Shortwave radiation from the sun passes through the atmosphere and is absorbed by the Earth's surface, raising its temperature. This heat energy is reradiated in the form of longwave radiation. Carbon dioxide molecules and other greenhouse gases are particularly effective at absorbing this longwave radiation and then reradiating it in all directions, including back toward the Earth's surface. I suggest a simple change to the existing language: *"These gases rise into the atmosphere where they can stay for thousands of years, trapping heat given off by the earth's surface."*

IMPLICATIONS FOR THE CITY OF REMOTE CLIMATE CHANGES. P. 13

It is vital to focus on the climate changes already directly impacting the city, but I also encourage the City of Saint Paul to think broadly about the implications of climate changes that are geographically distant but nonetheless may adversely impact the city. For instance, are the implications of climate change part of the city's risk management strategies for its investments? Are any of the city's financial resources in investments that might be vulnerable to losses due to sea level rise or flooding because of the intensification of rainfalls from hurricanes? How might climate changes elsewhere impact the city?

HOME ENERGY EFFICIENCY. P. 29

I encourage more explicit language at the end of person action #6. The current language reads, *"...consider switching appliances that run on natural gas, like your oven range, water heater or dryer to an electric alternative."* I propose, *"...consider switching appliances that run on natural gas to high-efficiency electric alternatives, such as induction cooktops and heat pump water heaters and clothes dryers."*

HIGH EFFICIENCY HEAT PUMP TECHNOLOGY, P.29

The technology already exists to reduce natural gas usage and therefore associated carbon dioxide emissions through the use of heat pump technology. Heat pump water heaters can be readily substituted for natural gas-fired or electric resistance water heaters and they offer the co-benefit of dehumidification, reducing or potentially even eliminating the need for households to run dehumidifiers. Heat pump clothes dryers also are beginning to become available. These offer the co-benefit of discharging heat into a basement, rather than to the outside, and thereby potentially increasing the efficiency of a heat pump water heater while also keeping a basement warmer during heating seasons.

Heat pumps in the form of mini-splits make it possible to readily retrofit homes with hydronic heating systems for summer air conditioning while also offering the opportunity to reduce or even eliminate the use of natural gas boilers during the shoulder heating seasons of spring and fall. Mini-splits can extract heat from outdoor air even at quite low temperatures, but their utility for heating homes in the depth of winter is limited by their existing air-to-air operations.

Air has a very low specific heat and so mini-splits need to operate continuously at low outdoor temperatures to maintain comfortable indoor temperatures, otherwise indoor temperatures fluctuate widely. A significant breakthrough in the use of heat pumps in place of natural gas-fired boilers would be their integration with existing hydronic residential systems. The high energy

efficiency of heat pumps combined with the high specific heat of water could realize substantial reductions in carbon dioxide emissions while providing residents in older homes with hydronic systems the level of comfort they expect. The city should consider how it could encourage applied research into the integration of heat pumps with hydronic heating systems.

BENEFICIAL RESIDENTIAL ELECTRIFICATION, P.29

The substitution of low-carbon or zero-carbon electricity for fossil fuels (beneficial electrification) will require a more robust and resilient electrical grid as our dependence on electricity increases. This issue will become increasingly important if the use of electrically powered heat pumps is favored over natural gas-fired residential boilers and furnaces. Does Xcel Energy have the ability now to identify power outages at the individual household level? If not, what would be required for it to be able to do so in the future? Is there redundancy in how electricity is delivered to the city?

MUNICIPAL WATER SUPPLY, P. 44

As part of ongoing repairs and upgrades of public infrastructures, it is important to be continually on the lookout for opportunities to reduce threats to the water quality of the Mississippi River by reducing non-point source pollution entering the city's storm water systems. The biggest threat, however, to the water quality of the river that serves as the backbone to the city's water supply is not the city itself but rather dramatic land use and land cover changes taking place in the watershed of the Mississippi River in northern Minnesota. The city should consider taking a more active role in encouraging policies and practices that enhance stewardship of the Mississippi River in northern Minnesota. For instance:

- The city could encourage changes to existing community solar rules so that individuals and entities in Saint Paul could subscribe to community solar gardens in the watershed of the Mississippi above the Twin Cities rather than only those in counties adjacent to Ramsey County, as I believe is currently the rule. In particular, the conversion of row crop agriculture in riparian areas along the Mississippi River to photovoltaics and perennial vegetation would yield multiple benefits – cleaner water for Saint Paul downstream, zero-carbon electricity for city residents and businesses, increased carbon sequestration to address global climate change, increase pollinator and wildlife habitat, and enhanced rural economic development.

- Saint Paul could encourage mass timber construction, as exemplified by the T3 building (https://bit.ly/2ZNDnmE) in Minneapolis. Such a policy could have multiple benefits for the city. An important factor driving the conversion of forestlands in northern Minnesota to row

crop agriculture is the lack of markets for wood products. New technologies such as cross-laminated timber (CLT) and nail-laminated timber (NLT) enable the construction of tall wood Buildings with environmental metrics superior to those buil with reinforced concrete or steel. Mass timber construction materials require far less energy to produce then their conventional counterparts. And the finished buildings can be quite energy efficient, and the wood embedded in their structures sequester large amounts of carbon while the trees that regrow on forestlands harvested to produce CLT and NLT in turn sequester still more carbon. Mass timber construction could be an intriguing climate mitigation strategy for the city.

RESIDENTIAL SOLAR. P. 47

The City's Climate Action and Resilience Draft Plan forecasts that by 2050 residential building emissions will come entirely from natural gas because of the expectation that Xcel Energy's electrical generation will be 100% carbon free by then. Yet a key proposed incentive is to offer a one-year production incentive for residential solar. Doing so would not seem to offer any decarbonization benefit and could potentially redirect financial resources from other efforts that would yield higher climate change mitigation benefits. Despite significant and anticipated ongoing price declines, electricity from residential rooftop solar probably will always be markedly more expensive than utility scale ground-mounted solar. A possible benefit from the encouragement of more residential solar could be greater resilience to power interruptions, but only if these systems are allowed to continue generating electricity during power outages. Currently, that is not the case.

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