

\* \* \* "GREENNOTES" VERSION \* \* \*

# FROM THE GROUND UP

TRANSITIONING A FAITH-BASED FACILITY TO SUSTAINABLE ENERGY  
USING SOLAR ELECTRIC AND GROUND-SOURCE HEATING & COOLING



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CASE STUDY: FIRST UNIVERSALIST CHURCH DENVER, COLORADO

ASSEMBLED AND REPORTED BY:  
MILT HETRICK

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Using Solar Electric & Ground Source Heating & Cooling

## “GreenNotes” Version

Case Study: First Universalist Church of Denver

*Assembled & Reported by:*

Milt Hetrick

Green First Task Force

First Universalist Church Denver, Colorado

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10 9 8 7 6 5 4 3 2 1

ISBN-13: 978-1-0822-3746-1

***“Never doubt that a small group of thoughtful, committed citizens can change the world; indeed, it's the only thing that ever has.”***

...Margaret Meade<sup>1</sup>

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## Preface

This document is a “GreenNotes”<sup>2</sup> version of a recent renovation project at First Universalist Church of Denver.

The First Universalist Church Denver, founded in 1891, is one of over a thousand congregations embedded in the larger Unitarian Universalist Association of Congregations (UUA).<sup>3</sup> The First Universalist congregation consists of around 546 adult members and 150 youth.

The building dates back to the 1960s. During this renovation project, the original 21,000 ft<sup>2</sup> facility was expanded to 28,000 ft.<sup>2</sup>

The project accomplished its initial goals:

- 1) Fix a leaky roof, 2) Accommodate more people in a larger Sanctuary,
- 3) Provide more classroom space, 4) Replace aging equipment, and 5) Use less energy to operate with windows and added insulation.

But there was more.

A small group of people within the congregation, sensing an impending anthropogenic global crisis in the near future, introduced a new concern and another goal. This goal was to upgrade the facility, so it stopped doing harm. The goal was to transition from a fossil fuel based energy system to a sustainable renewable energy operating system. The prevailing attitude at the mere mention of this idea was, “We cannot afford it.”

The story is real; the church is real. The people are real, but not identified to protect their privacy.

To orient the reader, there were several “groups” of people involved:

**The Church:** the congregation at large (church members and friends), the Staff, the Governing Board, and the Green First Task Force and two ad hoc committees: Building for the Future (BFF) Building Committee and the Renewable Energy Working Group (REWG).

**The Contractors and Inspectors:** General Contractor, Subcontractors for each trade, Commissioning Agents and local Building Inspectors:

**The Social System:** the “Church” and “Contractors” are embedded in a ubiquitous social structure intended to influence its members/citizens in a way that creates a civil society.

Today’s social system provides few, if any, financial incentives for the non-profit sector to make the transition to renewable energy. The story

identifies techniques to level the playing field for churches and other non-profit groups unable to benefit from tax-based financial incentives.

This project was based on a general “creation care” principle embedded in most world religions. Other religious communities can replace the Unitarian Universalist Seventh Principle<sup>4</sup> with their sense of stewardship for Earth. It is essential to find a common thread (i.e., a set of values) to bind the group together as they navigate their path around the inevitable obstacles on this journey.

## Executive Summary

After approximately a year of internal discussion and disagreement, conflict and compromise, a plan emerged to replace the fossil fuel energy system of First Universalist Church with a renewable energy system (using solar electric and ground-source geothermal heating and cooling).

On 6 Nov 2016, the congregation voted unanimously to approve the plan and proceed with the installation of this new sustainable energy system.

Financing for the new equipment was arranged internally through member donations and low-interest member loans. The church operating budget remained unchanged. Energy-related utilities continued to be around 2.5% of the total annual church budget. Instead of writing checks to a utility company for electric and natural gas, 'utility payments' are now used to repay the member loans over a 15-year time frame.

The church was closed for remodeling in August of 2016 and partially reopened for the Christmas Eve program 2017. Installation of the rooftop solar system was completed in March 2018. The new energy system became fully operational in June 2018.

The sustainable energy system has zero carbon emissions and avoids dumping 100 tons of CO<sub>2</sub> into the atmosphere annually. Also, this new system saves about 150,000 gallons of precious western water annually.

Instead of buying and importing energy from the local utility company, the church now harvests energy that is already onsite (solar energy incident on the roof and thermal energy under the north parking lot) to operate the facility.

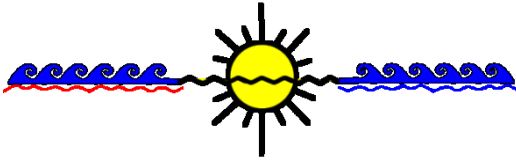
Transitioning to a solar and geothermal energy system is expected to reduce the 20-year life-cycle operating cost for energy by over \$150,000 compared to an obsolete ecocidal fossil fuel based system.

The Congregation takes pride in being able to join the ranks of those who declare, "We are Still In" the Paris Agreement despite what the current federal administration has decided. First Universalist is well along the Path to Zero GHG Emissions – a mandatory goal, as we currently understand climate science and the laws of physics if we intend to leave a habitable planet for future generations.

This document is a post-project summary of their path to zero greenhouse gas (GHG) emissions.



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## Introduction – Responding to Global Warming

*“The most remarkable feature of this historical moment on Earth is not that we are on the way to destroying the world... It is that we are beginning to wake up, as from a millennia-long sleep, to a whole new relationship to our world, to ourselves and each other.”*

*-- Joanna Macy<sup>5</sup>*



**T**oday our global community, our faith-based denominations, and our local congregations are coming together to respond to the climate crisis. This ‘coming together’ generates the human energy necessary for the transformation needed at all levels.

### **Global Response.**

Since 1994, the global community has been meeting annually to develop a response to climate change under the auspices/framework of the United Nations Framework Convention on Climate Change (UNFCCC). There were memorable events at each annual Conference of Parties (COP), but at COP21 in December of 2015, we see a significant milestone known as the Paris Agreement.<sup>6</sup> The 195 “parties” that attended expressed alarm about the harm humans were causing by continuing to burn hydrocarbons and dump greenhouse gases into the atmosphere. Of particular concern, global warming was already contributing to sea level rise and the submergence of island nations as well as coastal cities. A formal global response to climate change was published. A few excerpts are provided below:

#### **PARIS AGREEMENT (Excerpts)**

##### **Article 2**

1) ...this agreement...aims to strengthen the global response to the threat

## Introduction

of climate change... By:

a) Holding the increase in global average temperature to well below 2 deg C above pre-industrial levels and to **pursue efforts to limit the temperature increase to 1.5 deg C** ... recognizing this would significantly reduce the risks and impacts of climate change.

### Article 3

... The efforts of all parties will... recognize the need to support developing countries parties for the effective implementation of this Agreement.

When COP21 adjourned, each party left with an assignment – to re-examine their country’s sources of greenhouse gases and determine how rapidly they can transition to renewable energy sources and stop emitting CO<sub>2</sub> and other greenhouse gases. Each party submitted their goals along with a timeline for implementing these goals. On 2 May 2016, the UNFCCC Secretariat released an updated synthesis report outlining the aggregate effect of the intended nationally determined contributions (INDCs) submitted by 189 Parties as of 4 April 2016. The summation of the first round of INDCs indicated deeper reductions in GHG emissions were required than those voluntarily submitted on the first round.<sup>7</sup>

There is no question that what was happening in the global community contributed to the zeal and motivation of the Green First Task Force to push forward with their proposal for a zero GHG emissions energy system to operate the church.

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## Faith-based Denominational Response.

As a religious denomination, the Unitarian Universalist Association (as have many other denominations) expressed its concern about global warming. The story identifies some of the earlier UUA initiatives in response to climate change (e.g., General Assembly Resolutions in 2006, 2013, 2014, 2015). These statements by the UUA were used by the Green First Team to increase awareness of the climate crisis within the First Universalist Church Denver Congregation.

The UUA-sponsored UU Ministry for Earth (UUMFE) also played a key background role in raising environmental awareness. Specifically, the story highlights the UUMFE Green Sanctuary Certification Program.

## Congregational response.

Over several years, the Green First Team helped First Universalist Church of Denver make the necessary changes to complete the Green Sanctuary Program. The UUMFE certified First Universalist Church Denver as a Green Sanctuary in November 2010.

Although the Green Sanctuary program is very comprehensive, at the time, it did not require a congregation to develop a path to zero GHG emissions. The Green First Task Force derived the zero emission requirement from the 2015 Paris Agreement and the work of the IPCC who updated the remaining carbon budget to limit warming to 1.5 or 2 deg C in their 2018 Report. Because their goal is zero GHG emissions, First Universalist Church Denver indicates, “We are Still In.” [the Paris Agreement.]



## What the “GreenNotes” version of the story is about

Before 2015, the Green First Task Force was advocating for the installation of rooftop solar in response to the ever-rising levels of CO<sub>2</sub> caused by burning ancient hydrocarbons for energy. In 2015, their focus expanded to include both rooftop solar electric power (to replace Xcel’s fossil fuel generated power) and ground-source heat pump furnaces for clean heating and cooling (to replace their ten natural gas burning furnaces.)

This “GreenNotes” version of the story is a summary of the more detailed case study, ***“Transitioning to Sustainable Energy: Using Solar Electric / Ground Source Geothermal Energy Heating & Cooling.” A Case Study: First Universalist Church, Denver CO***

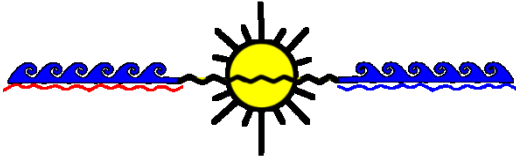
The “GreenNotes” version is not intended to be a historical record of the First Universalist transition project. Instead, it is a post-project summary designed to identify the critical steps along the path to zero GHG emissions. The “GreenNotes” Version does not attempt to provide sufficient details about the transition process to replicate the case study but instead gives a top-level report of what happened. Refer to the complete Case Study Version for more information.

This Case Study is a creation-care story about a bottom-up (grassroots) initiative started by a small group of concerned church members who were committed to preserving a habitable planet for future generations of life. They were committed to the 2015 Paris Agreement to limit global warming to less than 2°C. The subsequent 2018 IPCC Special Report clarifies that to limit warming to 1.5°C, every individual and organization must be on a path

## **Introduction**

that reduces GHG emissions by 50% by 2030. From there, the global community must achieve net-zero GHG emissions before 2050 to avoid the need for implementing extreme, large-scale carbon capture/sequestration measures.

This endeavor was possible only because of a team effort involving several dozen critical people with shared values working together on a common cause. We thank those who donated their time and energy, who sought to form right relationships, and who in any way supported this project.



## Part I: An Awakening- a Growing Awareness- (Pre 2016)

*"... do everything in our power to bring about a swift transition from fossil fuels to a sustainable energy economy..."*

- UUA General Assembly 2014 Business Resolution:  
**FOSSIL FUEL DIVESTMENT**

**T**oday our collective consciousness and environmental awareness is the accumulation of the heroic efforts by those who came before us. A few critical influences on the Congregation of First Universalist Church Denver are cited as examples. (Each faith-based denomination has their expression of climate change awareness.)

### **UU Ministry for Earth (UUMFE) (1989)**

The mission statement of the UU Ministry for Earth (UUMFE) is: "Connecting and inspiring an active community of Unitarian Universalists for environmental justice, spiritual renewal, and shared reverence for our Earth home."

Their vision is a world in which reverence, gratitude, and care for the living Earth are central to the lives of all people. Their purpose is to inspire, facilitate, and support individual, congregational, and denominational practices that honor and sustain the Earth and all beings. They affirm and promote the principles of the UUA, including the UU Seventh Principle "Respect for the interdependent web of all existence of which we are a part."

In 1991, the **Green Sanctuary Handbook** was published blending religious celebrations, education, administration, and community action. In 1999, Rev. Fred Small inspired a national environmental program. In 2002,

## Part I: An Awakening

the Green Sanctuary program began accrediting congregations. UUMFE was instrumental to the passage of the landmark 2006 Statement of Conscience on the Threat of Global Warming/Climate Change.

**NOTE: First Universalist Church Denver completed certification as a Green Sanctuary in November 2010**

## The Green Sanctuary Program

The Green Sanctuary Program provides a path for congregational study, reflection, and action in response to ecological challenges including climate change and environmental justice. Congregations that complete the program are accredited as Green Sanctuaries in recognition of their service and dedication to the Earth.



This program provides a structure for congregations to examine their current environmental impacts and move toward more sustainable practices in ways grounded in Unitarian Universalism. The program has four focus areas:

[Environmental Justice](#)<sup>8</sup> acknowledges that marginalized communities are often hit first and hardest by environmental crisis. In partnering with these communities, we can address human and environmental needs at the same time. Environmental Justice emphasizes a shift from providing charity to working in solidarity with the communities most affected by climate change.

[Worship and Celebration](#)<sup>9</sup> is the heart of Unitarian Universalism. As we work together toward a cleaner, more just and sustainable world, worship enables us to stay connected to each other and to celebrate the work we have accomplished.

[Religious Education](#)<sup>10</sup> shapes more than just minds. It shapes attitudes and practices.

[Sustainable Living](#)<sup>11</sup> requires us to treat the world more gently by using fewer resources and being mindful of the choices we make.



## UUA General Assemblies: Ethical / Moral / Spiritual Issues

Congregations that are members of the Unitarian Universalist Association generally adopt and adhere to the UUA Purposes and Principles:

See <https://www.uua.org/beliefs/what-we-believe/principles>.

Has the Unitarian Universalist Association documented a position on climate change and sustainable energy issues?

Yes. In 2006<sup>1</sup> and again in 2013<sup>12</sup>, 2014<sup>2</sup>, and 2015<sup>3</sup>, the Unitarian Universalist Association (UUA) General Assembly (GA) democratically voted and passed Resolutions about Energy, Climate Change and Divesting from Fossil Fuels.

A few excerpts are provided:

### **Statement of Conscience: 2006 UUA General Assembly**

Earth is our home. We are part of this world, and its destiny is our own. Life on this planet will be gravely affected unless we embrace new practices, ethics, and values to guide our lives on a warming planet.

As Unitarian Universalists, we declare by this Statement of Conscience that we will not acquiesce to the ongoing degradation and destruction of life that human actions are leaving to our children and grandchildren.

We as Unitarian Universalists are called to join with others to halt practices that fuel global warming/climate change, to instigate sustainable alternatives, and to mitigate the impending effects of global warming /climate change with just and ethical responses.

As a people of faith, we commit to a renewed reverence for life and respect for the interdependent web of all existence.

#### **Congregational Actions**

- Celebrate reverence for the interdependent web of existence in all aspects of congregational life;
- Treat environmentally responsible practices as a spiritual discipline;
- Seek certification through the Green Sanctuary Program of the Unitarian Universalist Ministry for Earth;
- Educate ourselves, our children, and future generations on sustainable ways to live interdependently;
- Use congregational financial resources to address the global warming/climate change crisis positively;



**Divestment from the Fossil Fuel Industry - 2013 Action of Immediate Witness: 2013 UUA General Assembly**

BECAUSE the Sources of Unitarian Universalism counsel us to heed the guidance of reason and the results of science;

BECAUSE Unitarian Universalist congregations covenant, in their Seventh Principle, to respect the interdependent web of all existence of which we are a part, and member congregations have demonstrated their commitment to this Principle in various ways, including by Green Sanctuary certification;

BECAUSE the 2006 Unitarian Universalist Association (UUA) Statement of Conscience calls on Unitarian Universalist congregations to “use congregational financial resources to address the global warming/climate change crisis positively”; and

BECAUSE the “UUA Socially Responsible Investment Guidelines” (2008) state that investments in companies engaged in negative global impact activities are to be avoided;...

WHEREAS, the global and growing movement 350.org is calling upon universities, pension funds, public entities, and religious institutions to divest their investments in 200 fossil fuel companies...;

WHEREAS, given the reality of climate change, passively profiting from business as usual in carbon-intensive fossil fuel companies is an abdication of our responsibility and thus morally wrong;

THEREFORE, BE IT RESOLVED that the 2013 General Assembly of the Unitarian Universalist Association calls upon delegates to begin a denomination-wide conversation within their congregations about divesting from fossil fuels or exercising shareholder influence. Congregations might discuss the following:

1. Stopping any new direct investments in fossil fuel companies, as listed in Carbon Tracker reports;
2. Divesting of all direct securities holdings in fossil fuel companies within the next five years;
3. Investing in diversified, socially responsible, and climate-friendly securities, and securities in the renewable energy and efficiency sector;
4. Investing in making their facilities more energy efficient, make widespread use of renewable energy, adopt conservation and efficiency measures;...

## Fossil Fuel Divestment-Business Resolution: 2014 UUA General Assembly

WHEREAS, Unitarian Universalist congregations covenant by our Second and Seventh Principles to affirm and promote justice, equity, and compassion in human relations and respect for the interdependent web of all existence of which we are a part; and

WHEREAS, the climate crisis threatens Earth systems through warming, destabilization of the atmosphere and climate, sea level rise, and the acidification of the oceans, of which the brunt of the burden has fallen and will fall on the poorest people in the world, who are least responsible for the crisis; and

WHEREAS, the 2006 Unitarian Universalist Association (UUA) General Assembly approved a Statement of Conscience on the Threat of Global Warming/Climate Change declaring “that we will not acquiesce to the ongoing degradation and destruction of life that human actions are leaving to our children and grandchildren;” and

WHEREAS, member congregations have demonstrated their commitment to environmental and climate justice by seeking Green Sanctuary accreditation, forming Climate Action Teams, divesting from fossil fuel companies, or other efforts; and...

WHEREAS, we have a moral responsibility to Earth, to all beings, and to future generations **to do everything in our power to bring about a swift transition from fossil fuels to a sustainable energy economy; and**

WHEREAS, the 2013 General Assembly overwhelmingly passed an Action of Immediate Witness for congregations to “Consider Divestment from the Fossil Fuel Industry;”

THEREFORE BE IT RESOLVED that this General Assembly calls upon the UUA to cease purchasing securities of CT200 companies as UUCEF investments immediately; and...

BE IT RESOLVED that this General Assembly encourages Unitarian Universalist congregations and Unitarian Universalists to ....to take action to end climate change, such as investment in renewable energy and conservation....

## **Act for a Livable Climate: Support a Strong, Compassionate Global Climate Agreement: 2015 UUA General Assembly**

WHEREAS, global climate change is fundamentally a moral and ethical crisis induced and exacerbated by human activity ...

WHEREAS, looming ecological catastrophes impacting food, water, and disease threaten the vulnerable and our descendants with mass suffering;

WHEREAS, we can act to limit the harmful consequences of climate change by effective risk management (adaptation and mitigation, including emission reductions, development of renewable energy, etc.),...

WHEREAS, our Principles impel us to act on climate change: The web of life is threatened: climate catastrophes (in near and long term) disproportionately impact the poor, disadvantaged, elderly, women, and children; issues of equity, justice, democracy, speaking truth, and defending the right of conscience are associated; and our descendants are threatened, raising intergenerational equity issues;...

WHEREAS, we are responsible as people of faith to mitigate, avert, and limit the potential catastrophes of climate change, standing with other faith traditions caring for our common home;

WHEREAS, Unitarian Universalists have committed to climate justice and stand in solidarity with first nation peoples, who are disproportionately affected by climate disruption;

WHEREAS, an December 2015, many nations of the world will gather in Paris for their last opportunity to negotiate the most important climate agreement in history;

THEREFORE, BE IT RESOLVED that the 2015 UU General Assembly calls on Unitarian Universalists to unify and provide ethical and moral leadership for climate action and to do so within our congregations and our multi-faith communities;

BE IT FURTHER RESOLVED that the 2015 UU General Assembly endorses a Unitarian Universalist delegation to the UN Climate Agreement Talks in December 2015 to support a strong, compassionate, fair, ambitious, binding, and enforceable international climate agreement.

It should be mentioned that the above UUA statements about 'creation care' have related counterparts in all of the world's religions.<sup>13</sup>

## Recent Events - 2018 IPCC Special Report

The 2015 Paris Agreement (to limit global warming to 2°C with every effort to limit it to 1.5°C) was clarified by the 2018 IPCC 1.5°C Special Report.<sup>14</sup> This latest publication provided a new awareness of the urgency of changing human behavior and reducing GHG emissions to net-zero. The 2018 IPCC report was compiled by 91 authors (climate science experts) from 40 countries around the world, who evaluated over 6000 scientific references.

Their findings indicated:

- 1) the remaining carbon budget for limiting warming to 1.5°C is around 530 gigatonnes of CO<sub>2</sub> (adjusted for Jan 2019),
- 2) adding more GHG will result in warming beyond 1.5°C,
- 3) there is a significant reduction in the habitability of our planet between 1.5°C and 2°C warming,
- 4) all pathways consistent with 1.5 °C global warming go to net-zero emissions before 2050 with a decline in net anthropogenic CO<sub>2</sub> emissions of 50% by 2030 as illustrated in Figure 1.

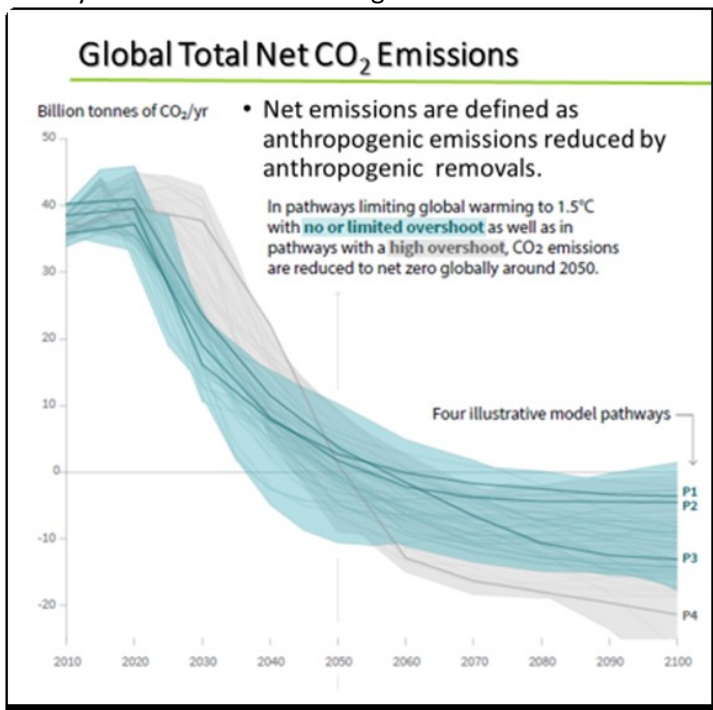


Figure 1 Paths to Zero GHG Emissions for a 1.5°C World (Ref: 2018 IPCC 1.5°C Special Report)

## Part I: An Awakening

At the current rate of burning, humans are adding around 43 gigatonnes of CO<sub>2</sub> per year. So if nothing is done to change behavior, the quota for a 1.5°C warmer planet will be used up within 12 years - by around 2030.

To be on a path to a 1.5 °C warmer planet, GHG emissions must be reduced by around 50% by 2030 and 100% by 2040-2050 depending on the amount of effort put into creating negative-emissions (carbon capture/sequestration). The new awareness of the urgency to respond to this existential climate crisis allows us to re-evaluate current goals that are on the books in Colorado.

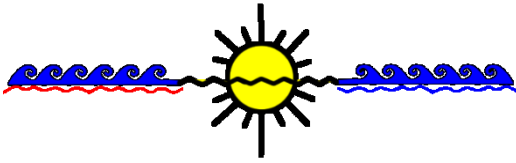
- Colorado RES: 20% by 2020 is not very meaningful now; it must be extended to 50% by 2030 or 100% by 2050 to be of value.
- Denver 80 x 50 Plan: 80% by 2050 will put Denver residents at a GHG emission rate per capita in 2050 that is equivalent to that of the average citizen of China or India **today**. Denver's 80x50 plan must become 100x50 with a companion plan of 50x30 to be meaningful.

It appears that too many people are expecting system level programs to solve the problem. These top-down programs have yet to be legislated. At best, a politically driven initiative for change will consume 2 to 6 years (depending on the 2020 election). Then it will be several more years to implement these programs and expect to measure reductions in GHG emissions.

Contrast this with a bottom-up approach, where organizations use the freedom and power they already have and "just do it." It took one year (from the time the project was approved) to install and operate the First Universalist Zero GHG Emission Energy System. There was an immediate reduction in GHG emissions equivalent to 100 tons annually. (The actual work time was less than one month, but the installers were delayed because of delays caused by the other trades working on the main renovation project.)

Currently, no Federal plans are being considered, even with the Green New Deal, to directly assist non-profit, faith-based organizations in financing new equipment necessary to reduce their carbon emissions to zero.

The good news is that faith-based organizations can empower themselves to reduce GHG emissions right now. As members of a faith-based group, individuals can magnify their power to bring about measureable change from the bottom-up while others work to change the social system from the top-down.



## Part II Setting the Stage (Apr 2016– 6 Nov 2016)

*“Communities of Faith need to lead the climate response...”*

*-- Colorado Interfaith Power & Light*

**T**his is one story of how a group of people, supported by a common faith-based foundation, worked together to achieve a common goal for the common good.

What emerged is yet another illustration that it is possible to bring together nothing but what already exists (e.g. commercial off-the-shelf 21<sup>st</sup>-century equipment) and create something more. The emergence described in this story did require a collaborating source of human energy. Religious communities are by nature a group of vibrant individuals bound together by common beliefs [L. *religio*, *-onis—re-*, back, *ligāre*, to bind.]. Such a community is well equipped to lead the way.

### **Brief History of the Project**

Starting in 2015, a core group of church members, referred to as the Green First Team, became advocates for a zero GHG emissions sustainable energy system for their church in direct response to the climate crisis.

In the Fall of 2015, prior to the capital campaign to raise money for the Building for the Future (BFF) renovation project, solar and geothermal equipment had become an integral part of the remodeling project. Solar and geothermal objectives had been included in the project’s design requirements “Sustainability Framework.” Contributions to the BFF project would be financing the new sustainable energy system. The Green First Task Force was elated. Their Ministry for Earth had been incorporated into the renovation project, and the church was on a path to zero GHG emissions in response to climate change. Hope was alive and well.

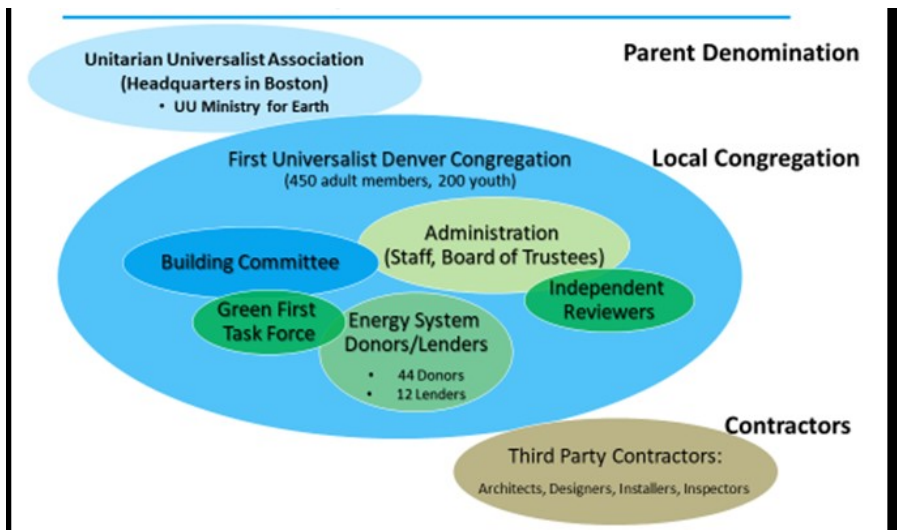
## Part II: Setting the Stage

The BFF capital campaign ended around March 2016. The \$3,502,834 raised in pledges fell well short of the estimated \$4.5M cost of the remodeling project. Consequently, to close the gap, the Building Committee reduced the scope of the project to \$4,009,545 and planned to acquire a commercial loan of \$400,000 to make up the difference. It was a difficult time for the BFF Building Committee; nevertheless, they had no choice but to accept the outcome of the capital campaign and deal with it.

Because of the shortfall in pledges, the project was downsized. The new sustainable energy system, some classrooms, and several other items were deleted from the renovation project.

The Green First Team's morale was devastated. Nevertheless, they were given congregational authority to launch their separate capital raising campaign specifically to finance the new sustainable energy system. The renewable energy system was estimated to cost around \$450,000 and represented 10% of the total renovation project cost.

## Who were the People Involved?



The small group of advocates/supporters of a 100% Sustainable Energy System slowly grew in number, as well as resolve, during the project. Collectively, the Green First Team and their colleagues identified the obstacles in their path and figured out ways around them.

For several months in the summer of 2016, this growing number of

advocates for change worked under the auspices of an ad hoc committee called the Renewable Energy Working Group (REWG). The REWG committee was comprised of representatives from the Board of Trustees; the Building for the Future (BFF) Committee; the Green First Task Force; two Independent Reviewers (engineers from the congregation), and the Senior Minister.

A sustainable energy system design, cost estimate and financing plan evolved and was presented to the Board of Trustees for approval. After several iterations, the Board approved the funding approach in Oct 2016. The proposed revenue-neutral funding approach backed by member donations of over \$200,000 and member loans of \$240,000 was presented to the congregation and approved by a unanimous vote on 6 Nov 2016. The new energy system design and funding were then added contractually into an ongoing renovation project.

Within seven months, First Universalist had crafted a financing approach to purchase and install a new 100% Sustainable Energy System.

After the funding was in place and approved, members of the Green First Team monitored the detail design and installation of the energy system to assure the needs of the congregation would be met.

## What Emerged?

**A Church with a Sustainable Energy System**

**Solar Electric**

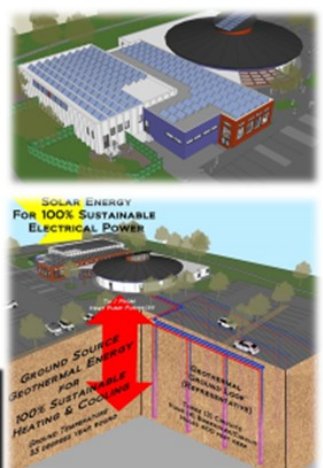
- 57 kW solar PV system
  - 180 Modules
  - Commissioned: June 5, 2018

**Ground Source Geothermal Heating & Cooling**

- 45 Ton rated system
  - 10 heat pump furnaces
  - 12 boreholes 400 feet deep

**Benefits:**

- No burning of ancient hydrocarbons
- No GHG emissions
- No further harm
- Compliance with Paris Agreement (1.5°C)



Deconstruction / Construction of the BFF remodeling effort began in August 2016. The ten natural gas-fired furnaces and domestic water heaters

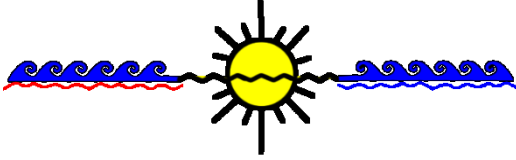


## Part II: Setting the Stage

were removed and recycled as part of the Deconstruction Phase to Reuse/Recycle as much as possible. Installation of the geothermal ground loop was delayed until city water was available at the work site in June 2017. Drilling, trenching and installation of the black plastic pipe for the ground heat exchanger was completed in about a week. Circulation pumps and water hook-up to the ten new heat pump furnaces occurred right after the HVAC contractor installed the furnaces in October 2017. When the HVAC control system was installed in Nov 2017, the new geothermal heating and cooling system became operational in Dec 2017. General construction was completed sufficiently to utilize the new Sanctuary for the Christmas Eve service on 24 Dec 2017. The lower level of the facility, consisting mostly of classrooms & meeting rooms was still under construction in December and completed in February.

Mechanical installation of the solar PV system was delayed pending the installation of foam insulation on the roof. After the insulation was installed, the solar system was completed with a final inspection in March of 2018 - in time for the official dedication of the remodeled facility on 1 April 2018. Excel Energy installed the net meter late in the afternoon of 1 June 2018. City Electric activated the system on 5 June 2018, and the facility began operating using solar power.

Using 21<sup>st</sup>-century equipment, the church could now harvest inexhaustible emission-free energy (that is already onsite) to operate the renovated facility. With the new energy system, the church can now use the annual sunlight they receive to generate their annual electrical power needs and the thermal energy in the ground beneath them and in the air surrounding them for all heating and cooling purposes. No net energy needs to be imported.



## Part III A "GreenNotes" Version of the Project

*"If you have built castles in the air, your work need not be lost;  
there is where they should be.*

*Now put foundations under them."*

*-Henry David Thoreau (Walden)*



**W**hat happened at First Universalist Church Denver is a specific case study and may or may not represent what other faith-based organizations might encounter.

### Introduction

The story documents (with gratitude) areas where First Universalist Church Denver was able to build on the experiences of others who traveled this path earlier and helped light the way (e.g., Mt. Vernon Unitarian Church, Alexandria VA; Christ the Servant Lutheran, Louisville, CO; St John's Episcopal, Boulder, CO; and Jefferson Unitarian, Golden, CO to name a few.)

In general, much of what happened during this project was not anticipated or preplanned. Looking back, what happened was simply the response to member questions and concerns encountered along the way.

In a sense, the members who asked thoughtful questions and who offered their critique were the people who charted the specific Path to Zero GHG Emissions.

Fortunately, the Green First Team shared the same religious/spiritual values with those church members who were skeptical about the project. By working together, they found a way to navigate around each specific obstacle along the way.



### Part III: “GreenNotes” Version

## What was the Motivation to Change?

Before describing “How the Church Transitioned to a 100% Sustainable Energy System” to comply with the Paris Agreement, it is important to ask, **“What was their Motivation?”**

Upon reflection, it was evident that “motivation to change” was a key element of this project. Motivation can be reframed as “human energy.” It appeared that a critical amount of human energy had to be amassed and then focused to bring about this change. Everything else needed was commercially available, i.e. “on the shelf” ready to be assembled.

In the beginning, except for the handful of people on the Green First Team, there was little motivation (human energy) to respond to global warming/climate change among church members. Most church members were not aware there was anything wrong with how the church was operating. So they wondered why go to the trouble and expense of fixing something that was not broken?

Admittedly, there were several members who would have said, “OK, adding solar panels on the roof would be a good thing - as long as it doesn’t cost anything.”

Motivation, or lack thereof, seemed to be one of the first significant challenges confronting the Green First Team. The Team found it was prudent to tap into every source of motivation available because a significant amount of this human energy was going to be required to transition from fossil fuel energy to renewable energy.

Based on observations of the First Universalist Church project, motivation is one area where a faith-based organization has a distinct advantage. As a group, all members of the church have a common religious/spiritual belief. These shared values can be the foundation for building relationships and solving problems (i.e. managing conflicts) that occur along the way.

Note: The project also identified several areas where religious organizations (and other non-profits) have distinct disadvantages (e.g., particularly in the financial sector) as discussed later.

The following list identifies sources of motivation observed to be useful in garnering support for their project.

- Religion/Spirituality – (Religious Values, e.g. Creation Care; Ethics/Morality.)
- Science - (Reason & Logic / Factual Evidence / Physical Reality.)

- Economics - (Classical, Pigovian.)
- Environmentalism / Ecology – (Environmental Justice, Interdependent web of life, Avoiding the 6<sup>th</sup> Mass Extinction)
- Nurturing Instincts – (Parenthood / Grandparenthood, Empathy, Altruism, Common Good, Do No Harm, Non-violence, Possibility, and Hope)
- Cosmological Reverence – (13.7 Billion Years of Deep History, 3.5 Billion years of Evolution and an expanding consciousness that humans are threatening to end within another century)
- Social instincts / Collective Consciousness / Biomimicry
- Subconscious Intuition / Survival instincts – (Present Peril; Imminent Threat, Situational Awareness)

The following is an attempt to generalize observations from the First Universalist Case Study so they might apply to other faith-based organizations.

### **Religious, Spiritual, and Ethical Values.**

The Green First Team helped identify and align their congregation with intrinsic motivations embedded in their faith-based organization.

As a general observation, each faith-based organization and spiritual tradition has a unique way of expressing their beliefs about creation care and right relations. Each denomination has deeply held values that relate to their response to climate change. These values can be acknowledged, discussed, and used to the fullest measure. One place to start this search for Faith-Based Statements on Climate Change is a publication by Citizen Climate Lobby and Citizens' Climate Education, Coronado, CA, 2015 (second edition). Statements from 22 different denominations are included in this work. See:

[https://issuu.com/citizensclimatelobby/docs/faith-based\\_statments](https://issuu.com/citizensclimatelobby/docs/faith-based_statments).

Based on this case study at First Universalist Church Denver, their renewable energy transition project emerged because common guiding principles motivated enough people involved. In this case, the UU Seventh Principle: “Respect for the interdependent web of all existence of which we are a part” served as a common deeply-held source of motivation. Becoming aware of the actual harm they were currently doing to the web of life became a powerful motivation for some members of the congregation to change.

The Green First Team also identified “Statements of Conscience” from the larger Unitarian Universalist Association about climate change, divesting

### **Part III: “GreenNotes” Version**

in fossil fuels and transitioning to renewable energy.

There are many other sources of motivation related to ethics and morality that can be brought to light also.

The following identifies secular sources of motivation the Green First Team found useful to connect with a more significant number of their fellow congregants.

#### **Science-based motivations.**

They found ‘reason and logic’ was a powerful source of motivation for many congregants. For those members who have a science background, climate science is a significant motivator. These members are deeply moved by the overwhelming evidence that links extraction, transport, and burning of ancient hydrocarbons to the increase in greenhouse gases in our atmosphere. They understand the physics of infrared absorption of electromagnetic energy passing through the atmosphere. They understand how infrared energy is absorbed by specific molecules (characterized as greenhouse gases) and converted into thermal energy (i.e., temperature). The Green First Team used the new story of what is happening as told in the language of science because it was a powerful motivation for some church members.

#### **Global Citizen Responsibility (e.g. 2015 Paris Agreement/2018 IPCC 1.5°C Report)**

Some people will join the ranks of an energy transition project (intended to stop doing harm) out of a pure sense of duty as a responsible adult and global citizen.

This awareness “that something is not right and human behavior is contributing to the climate crisis” is becoming a global concern. More and more people are demanding that something be done to change human behavior.

According to the 2018 IPCC Special Report, to be on a path to a 1.5 °C warmer planet, GHG emissions must be reduced by around 50% by 2030 and 100% by 2040-2050 depending on the amount of effort put into creating negative emissions (carbon capture/sequestration).

Using several workshops, the Green First Team encouraged the use of personal freedom and power to reduce GHG emissions in the member’s private lives. Members were encouraged to join groups where they could

magnify their power to bring about a more significant change in organizations. Details are provided in the complete Case Study Version.

### **Economics and Financial gain**

The Green First Team observed that becoming fiscally responsible investor was essential to some church members and especially the Board of Trustees and Senior Minister.

By doing their homework, the Green First Team was able to reframe “We cannot afford it” to “We cannot afford to continue to use a fossil fuel energy system.” to “We don’t know how to finance the transition, yet” to “Oh! There is a way to transition to renewable energy, and it is less expensive than burning fossil fuel!”

For example, the Green First Team found that over the past 20 years natural gas prices in Colorado have doubled – i.e., increased an average of 5% / year.

As the finite supply of fossil fuel is depleted, there is a good reason to believe the price of fossil fuel will continue to increase over the coming 20 years. (This, of course, is not the case for energy derived from wind and solar that is expected to decrease in cost over time.)

The Green First Team conducted a 20-year Life-cycle Analysis (LCA) to compare the life-cycle cost of the existing fossil fuel based energy system with the life-cycle cost of the proposed renewable energy system. Assuming a 3-4% annual increase in fossil fuel costs, they found there is a financial gain in transitioning to renewable energy when a Life-cycle Cost Analysis is performed. Details are provided in the detailed Case Study.

### **Environmental Justice, Empathy for Others.**

The Green First Team observed that for some members, the environmental injustice associated with continuing to burn ancient hydrocarbons was unconscionable. As a result, injustice became the motivation to change. It was disconcerting to acknowledge that the most detrimental impact seems to be to those who pollute the least. In their presentations, the Green first Team included Article 2 of 2015 Paris Agreement that addresses the commitment to **Stop Adding** greenhouse gases to our atmosphere; and Article 3 that expresses a commitment to **Start Helping** developing countries who have been negatively affected by our (developed countries) past industrialization.

### Part III: “GreenNotes” Version

The Green First team used IPCC and EPA data to remind members that the average American dumps five times more CO<sub>2</sub> into the atmosphere than the average Chinese citizen. As Article 3 of the Paris Agreement suggests, it would be prudent to help them energize their countries using renewable energy that does not contribute GHG emissions, so there is a minimal increase in global warming as they become more “developed.”

### Parent and Grandparent Responsibilities.

The Green First Team understood that envisioning the future of children and living on a less habitable planet moves many people to support a clean energy transition project now. They understood because members of the team were themselves parents and grandparents.

### Cosmological Reverence.

The Green First Team observed that for some church members, the awe created by comprehending the 13.7 billion year Universe Story becomes a powerful motivation to change their current ecocidal human behavior. When the 3.8 billion year evolution of life on planet Earth is juxtaposed on the possibility that we 7.5 billion humans can now bring the evolving consciousness of living systems to an end within this next century, the emotional response can be overwhelming. Joining others in a ‘project for change’ is a healthy, constructive way to harness and redirect this paralyzing angst.

### Biomimicry.

It was observed that several members had deep attachments to the natural world. In their case, the idea of Biomimicry was a valuable guide to right relations and sustainable living. By adding leaves to the roof of the church (solar panels), the church would be able to capture/harvest sunlight as a source of energy. By growing some roots (inserting some pipes into the ground), the church could exchange heat (thermal energy) with the Earth to stay cool in the summer and warm in the winter. Using biomimicry, congregants became integrated with their sustainable facility to form an evolved living system. Taken as a whole, people and facility harvest sunlight to grow spiritually and flower or bear fruit (carry out a



mission).

### **Possibility and Hope.**

The Green First Team also observed a less defined source of motivation that can only be described as optimism. There are some church members, who are not scientists, not financial experts, may not be considered as environmentalists or naturalists. They do understand there is a climate crisis and there is a solution. They do understand the transition of the church to renewable energy is part of the solution. They are hopeful and willing to help as they are able and be a part of the solution. If you ask them, they will help. With all this awareness combined with the possibility for change, there is certainly reason for hope.

### **Situational Awareness**

It can also be observed that there are members with good situational awareness. It is as if there are familiar with the NOAA compilation of “severe weather” related damage for the past several years. In 2017, the cost of severe weather was over \$300 Billion (the year of Hurricane Sandy.) The weather-related damage for 2018 was only \$91 Billion.<sup>15</sup>

Situational awareness is being aware of:

- extreme weather events (intensity of hurricanes, storm surges, rainfall, flooding, mudslides);
- drought, crop and livestock losses, fires);
- glacial and polar ice melt, sea level rise, etc.;
- extreme temperatures hot & cold;
- displacement of the island and coastal populations;

This awareness is unsettling. Records are being broken continually. Something is going on that is not in the direction of goodness. This situational awareness can become a motivation for change.

### **Path to Zero GHG Emissions**

Although the 2018 IPCC Special Report was published after the First Universalist, renewable energy system was installed and in operation, the goal of the Green First Team had been to install a 100% sustainable energy system that had zero GHG emissions – especially after the 2015 Paris Agreement. Replacing the fossil fuel energy system was the first priority on the path to zero emissions for the facility.

The Green First Team had tried to make their perspective clear from the beginning of the project.



### Part III: “GreenNotes” Version

Climate change is the most complicated global level existential issue homo sapiens have ever faced. The scientific issues and method of avoiding a human-caused mass extinction are **well established and verified** by climate scientists around the world. Although understanding the complex interaction of all the relevant phenomena is extremely difficult thereby making climate change modeling complicated, **the solution to this existential crisis is simple.**

- **STOP** adding CO<sub>2</sub> and other GHG to our shared atmosphere.
- **ACCELERATE** the inevitable transition **from** extracting/burning hydrocarbons as an energy source **to** harvesting inexhaustible sources of energy (solar, wind, hydro, geothermal, ...)

**There is Good News.** The Universe is giving us sustainable sources of energy that are inexhaustible. These alternatives to fossil fuel are energy sources that do not add GHG to our atmosphere. Today, these endless energy sources are less costly than extracting & burning ancient hydrocarbons.

So how does a faith-based organization get onto a path that leads to zero GHG emissions? There are many paths to zero emissions. Each organization has a unique starting point; however, the steps may have similarities.

Looking back along the path First Universalist Church took, it appears their approach can be summarized as ten steps listed in Figure 2.

# Transitioning to Sustainable Energy

## Emergence:

creating something extraordinary from nothing but what already exists



Figure 2 Steps Along the Path to Zero GHG Emissions

## 1. Assemble a Group of Advocates – a ‘Green Team’

First, they formed a group of advocates – a Green Team. First Universalist called its team the ‘Green First Task Force’ or the ‘Green First Team.’ The Green First Team was formed several years before taking on this project to transition to a 100% sustainable energy system.<sup>16</sup> So this small group not only shared religious values, but they already had built working relationships.

The Green First Team started advocating for a rooftop solar photovoltaic (PV) system to generate electrical power in 2011 but were asked by the Board to delay their initiative until the church had an opportunity to assess long-range plans for the aging facility. Options at that time ranged from moving to a new location to scraping the existing lot and rebuilding a new facility, to remodeling the existing facility.

There was also much happening in the broader community. Climate change awareness was expanding. Consciousness was evolving. Environmental concerns were overlapping with broader concerns about living sustainably on a finite planet. The Occupy Wall Street movement in 2011 had identified fundamental issues within the U.S. social system – specifically the economic system. The message of Bill McKibben and 350.org had grown into a formidable challenge to the Keystone XL oil pipeline project. More and more people were becoming aware that any human effort that enabled the further extraction/production of any fossil fuel, especially tars sands oil, was a fool’s folly. Naomi Klein had reframed the climate crisis as “This Changes Everything: Capitalism vs. the Climate.”

It was not until 2015 that a decision was made about the future of the church facility. The congregation decided to remodel/renovate the existing building. By then, several members of the Green First Team had installed rooftop solar on their homes, one had replaced their gas furnace with a ground-source heat pump, and several others were driving plug-in electric vehicles.

At this point, the Green First Team was comprised of around a half dozen thoughtful, and committed people. They became the initial engine of change.

Based on the experience of the Green First Team, several suggestions are offered:

- a) Do invite a few STEM<sup>17</sup> folks to be on the team – there will be some climate science, some energy technology, some project engineering and some financial mathematics involved along the path to zero emissions,

b) Encourage anyone concerned about the climate crisis and living sustainably to be a part of a “Green Team.” Other helpful skill sets to have on the Green Team include legal, graphic design, media & communication, and conflict management, to name a few.

## 2. Do Some Homework. Define What is Needed & Why. Motivate.

The Green First Team completed some homework to be good stewards of the church’s financial resources. They also wanted to enhance effective communication with architects, engineers, installers and other professionals who would eventually be contracted to perform the work.

Some of the early homework was intended to envision the range of technology options available for their application. They quickly learned there was already sufficient energy onsite (in the form of sunlight) to generate all the electrical power they needed. They learned there was enough thermal energy (in the air or the ground) for all their heating and cooling needs. The STEM team members were able to assess the available roof area, parking lot area and the grounds for solar and ground-source heat exchange potential. They looked into local, city, county, state and utility regulations that may restrict or constrain their project. They did not find any significant externally imposed obstacles (e.g., historical preservation constraints) preventing the project from proceeding. Nor did they find any noteworthy public sponsored incentives.

So the homework continued to determine what was needed.

### **Assemble the Total Operating Cost of the existing fossil fuel energy system**

The Green First Team collected a year’s worth of energy-related utility bills and separated the electric and natural gas costs. They used the actual utility bills to define annual expenses because they defined what a revenue neutral funding model must replicate.

The Green First Team was told by a Board member that any funding approach for a new system that increased the annual cost of utilities was a non-starter. Here is an example of what the Green Team found:

- **The church was spending about \$16,000 / year for gas and electric.**
- **The average age of their ten gas-fired furnaces was about 15 years, so the estimated annual replacement cost of aging equipment was close to \$3250.**
- **The church was currently spending \$19,250 annually for the fossil fuel based energy system**

### Part III: “GreenNotes” Version

- **A cost escalation factor of 3-5% / year was assumed to project these costs into the future**

A simple spreadsheet model was used to illustrate how the \$19,250 utility cost can be expected to increase over the next 20-25 years.

**The new system annual cost must not exceed the yearly fossil fuel cost  
(to be approved by the Board)**

**Identify and quantify the amount of harm** the current fossil fuel system is doing in terms of greenhouse gas (GHG) emissions. The Green Team quantified the amount of damage the church was causing in terms of the amount of greenhouse gas being dumped into the atmosphere each year. Using the techniques described in the detailed Case Study, they quantified the harm.

- **The church was responsible for dumping about 124 tons (112 metric tonnes) of CO<sub>2</sub> eq/year into the atmosphere.**

#### **Create a graphical image that depicts the GHG emissions.**

As shown in Figure 3, the Green First Team used “black smoke plumes” to represent the GHG emissions coming from each furnace flue in the building and one large smoke plume in the background to represent GHG emissions from the nearest Xcel Energy fossil fuel generating plant.

## First Universalist Was Doing Harm in 2016

- **Fossil Fuel Based Energy System**
  - **Bought Electric and Natural Gas from Xcel**
  - **Burned Natural Gas for heating (10 gas fired furnaces)**
  - **Dumped 112 tonnes of CO<sub>2</sub> into the atmosphere annually**
  - **We were doing harm (and not living our values)**

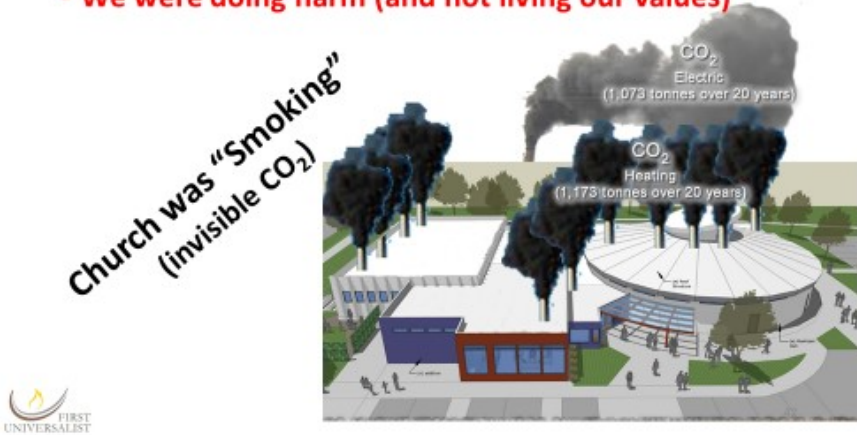


Figure 3 illustration of the GHG emissions from First Universalist Church in 2016

### Include externalities (Ignored social costs)

[A detailed discussion of Externalities is provided in Unabridged Case Study. The following is a summary.]

In addition to the harm caused by adding GHG to the atmosphere, the Green First Team was well aware there was additional harm caused by burning fossil fuel. Epstein et al.<sup>18</sup> of the Harvard Medical Center analyzed the true cost of the electric generated by a coal-fired plant. Epstein's group considered a dozen externalized (ignored) social costs. For example, land disturbances, methane emissions, carcinogens, air pollution (resulting in respiratory disease, asthma), mercury emissions (resulting in mental retardation, cardiovascular disease). Epstein et al. monetized this short list of ignored social costs and concluded the actual cost of electricity generated by a coal-fired plant should be increased by \$0.18 to \$0.27 / kWh. The true cost of coal-generated electricity is a factor of 2.5 to 3.3 times its current market price, clear evidence today's economic measuring system in the U.S. is broken. Let's say that when the free market is not grounded in reality but uses fictitious prices to compare various forms of energy, even Adam Smith's invisible hand cannot be expected to find the most efficient option.

### **Part III: “GreenNotes” Version**

As a result of using a broken measuring stick, the current economic system is leading good people to make some bad (ecocidal) decisions.

If ignored costs are included in the “cost analysis” (i.e., externalities are internalized), it is overwhelmingly evident that the true cost of fossil fuel is much more expensive than renewable energy. If the actual cost of burning fossil fuel were used in the free market, everyone would be transitioning to solar, etc. in a heartbeat.

When the Green First Team presented this perspective of externalities to the Building Committee and Board, they were told not to discuss this again in future presentations. The Green First Team quickly decided the issue of externalities was a hill too steep to climb – it certainly was not “a hill to die on.” Therefore, they continued to use the classical (broken) economic frame of reference in all “cost” discussions.

### **Envision a New Energy System with Zero GHG Emissions**

Using open source tools described in the detailed Case Study, the Green First Team developed their own “Ball-Park” estimate of a new energy system requirements based on the past year’s usage. For a net-zero facility, they estimated the church would need the following equipment:

- Solar PV System: 57 kW rated system (180 panels/modules)
- Heating and Cooling System: Replace ten natural gas furnaces with ten ground source (geothermal) heat pump furnaces. (Total: 45 Ton rating)

Knowing the size of the new energy system, the Green First Team estimated the cost of buying and installing the new system and arrived at the following:

- Initial Cost Estimate: ~\$450,000 (Solar plus Geothermal)  
[10% of the main remodeling project would be sufficient to stop doing harm]
- Operating Cost: Minimal Service Charge & Connect Fee (TBD).
- Expected financial gain after 20-25 years:  
\$150,000 to 200,000 (plus possible Xcel Rebates?)

Now the challenge was to devise a viable financing plan under the following assumptions:

- No tax benefits /subsidies for a non-profit organization
- No change in the church operating budget (Revenue-Neutral),
- No up-front money,
- No future balloon payments.

At this point, the Green First Team had to acknowledge non-profits do not have access to the same financial incentives for transitioning to renewable energy available to homeowners and “for-profit” business.

They could see there was “money to be made” in solar, but not so much in geothermal because natural gas was so inexpensive (using classical economics with ignored costs.)

The Green Team made the following decisions:

- **Keep solar and geothermal together as an energy system.** The combination eliminates all GHG emissions, provides a path to zero emissions and should still be profitable,
- Solar-only is not a path to zero GHG emissions. Solar-only now may even make it harder to get on a path to zero emissions later.
- Make the Board an airtight offer they cannot refuse.
- Identify & examine common values, ethics, beliefs. This common ground becomes a bond that helps everyone involved stay together and work together toward a win-win solution when the going gets rough,
- Stop importing energy; Start honorably harvesting energy already onsite.
- Determine a 20-year “Should Cost” as a baseline. (assume a 3-4 % annual increase in hydrocarbon energy costs). This baseline cost can be used to evaluate Power Purchase Agreements, Leases, etc.

The Green First Team found it was easy to convince the Building Committee to include energy efficiency upgrades such as better windows, more insulation, better air sealing, more efficient lighting (LEDs instead of compact fluorescent). However, it was a challenge to convince them to buy and install a new sustainable energy system. Installing rooftop solar was an easier sell “as long as it didn’t cost anything.” However, replacing the “perfectly good gas furnaces” with new geothermal heat pumps met with much resistance.

The Green First Team found it is prudent to establish a baseline Life-cycle Cost analysis assuming they could purchase all the equipment without borrowing money and incurring usury fees. Then they could compare various options: Power Purchase Agreements (PPA), Lease agreements, Community Solar Gardens, Pre-paid PPAs, financing with commercial loans and several other possibilities with the baseline cost.

The Green First Team also found it prudent to craft a response to “Frequently Asked Questions.” A sample list from the First Universalist experience is provided in an Appendix of the detailed Case Study. They quickly learned it was important to develop a response to the common comment “We cannot afford it.” Another common response was “What’s the payback time?” They also learned to draft a response to “How can we



### Part III: “GreenNotes” Version

even think about replacing our perfectly good gas-fired [Furnace, Boiler, Water Heater, Cook stove]? Let’s just wait until they wear out in 10-20 years.” Hint: Build an awareness (a new frame) that tells the truth “There is no such thing as a good natural gas [Furnace, Boiler,... ] no matter how efficient or how new it is.” Knowing what we know today if it burns fossil fuel, it is adding GHG to the atmosphere. Everything associated with burning fossil fuel is now obsolete and unethical based on today’s consciousness. The Green First Team would often remind folks there are numerous sustainable applications for ancient hydrocarbons (e.g., adding carbon to iron to make steel. Steel can be 100% recycled indefinitely; using carbon to make carbon fibers for light-weight materials – particularly for transportation, etc. The carbon materials can be recycled.) But humans must stop **burning** these limited supplies of ancient hydrocarbons.



### 3. Inform, Educate the Board/Congregation about the Climate Crisis

One of the more critical roles of the Green Team is to share their understanding of global warming/climate change with their fellow congregants. Everyone deserves to be informed of the existential nature of the climate crisis and the urgency to respond in a meaningful way.

As illustrated in the detailed Case Study, the process of increasing awareness of this threat to the well-being of all life on our Planet can occur in several ways.

For example, the Green First Team provided Workshops, Science Meetings, a Geothermal 101 Presentation, Town Hall style meetings, and even conducted several Sunday morning services (including sermons) to help fellow congregants become more aware of today’s climate crisis. Members of the Green First Team also met several times with the architects and mechanical designers to assure their green goals and objectives were being incorporated into the building design.

Whenever the Green First Team learned there was a specific church member who was skeptical about the project (and there was a wide range of concerns), a member of the Green First Team would personally contact them and listen to their concerns. Almost always, the skeptical church member’s concerns were resolved, and they too become moral supporters and even financial supporters.

The Green First Team also considered it essential for their clergy (Senior Minister) and staff to be involved in this “bottom-up” action that responded to climate change. Without their support, an energy transition project

### Part III: “GreenNotes Version”

involving the entire congregation would not be possible. Clergy can serve as subtle (or not so subtle) advocates for the project in the pulpit and behind the scenes. Clerics understand that if their church, synagogue, or mosque is in right relations with its surroundings, it becomes a guiding light within the community. The Green First Team observed that gaining clergy support can be challenging unless the financial model is revenue-neutral and does not draw down the church budget or detract from the organization’s operating budget (to be discussed later).

Another role of the Green First Team was to provide new ways of thinking.

***“We can’t solve problems  
by using the same kind of thinking  
we used when we created them.”***

*... Albert Einstein*

To introduce new ways of thinking, members of the Green First Team had introduced ideas from the Unitarian Universalist Ministry for Earth Green Sanctuary Program to the congregation about five years earlier.

More recently, they introduced updated ways of thinking to the congregation such as:

- Ideas from the Occupy Wall Street Movement and economists like David Korten, Robert Reich, Joseph Stiglitz, Paul Krugman and Gregory Mankiw who are questioning today’s financial sector,
- Ideas from environmentalist such as Bill McKibben and 350.org, the Sierra Club, etc. expressing concern about the amount of GHG humans are adding to the atmosphere,
- Scientific evidence from climate scientists like James Hansen, Michael Mann, and the thousands of climate experts who form the International Panel on Climate Change (IPCC) warning us of the imminent danger of global warming. The IPCC indicates the remaining carbon budget is around 530 gigatonnes of CO<sub>2</sub> to limit warming to 1.5°C. [The IPCC Special Report is discussed earlier in the body of this document]
- Importance of properly “framing” an issue using the research of George Lakoff as documented in ***“Don’t think of an Elephant.”*** See Appendix E of the Detailed Case Study for more details.
- Ideas about different approaches to investing. For example, Woody Tasch was invited to talk church members about his book ***“Slow Money”*** and socially responsible investing.
- Ideas from Lynne Twist’s ***“The Soul of Money”*** were used, such as *“We’ve made money more important than God or spirit.”* or *We’ve*

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*given money more power than ... love, or our relationship with one another.”<sup>19</sup>*

- Ideas from Naomi Klein’s ***“This Changes Everything-Capitalism v The Climate,”*** were paraphrased including, *“Climate Change pits what the planet needs to maintain stability against what our current economic model needs to sustain itself.”* Also, *“The Climate Justice fight ... is a fight for a new economy, a new energy system, a new democracy, a new relationship to our planet and each other, for land, water, and food sovereignty, for Indigenous peoples rights, human dignity, and rights for all.”<sup>20</sup>*

Indeed, it was from these different ways of thinking that the Green First Team found their path to zero GHG emissions and was able to grow their circle of support within their congregation.



## 4. Develop a Revenue Neutral Funding Model

**T**his may be the most critical role for a Green Team.

Installing a sustainable energy system requires a significant investment in new capital equipment; so there will be a significant initial cost for the new system. Both the existing and proposed energy systems will have operating costs generally described as annual costs; the operating expense for the fossil fuel system is significant. When the initial and operating costs are added up over 20-25 years, the renewable energy system life-cycle cost will be less. There will be a financial gain in transitioning to renewable energy. How do you know there will be a financial gain?

***“The best way to predict your future is to create it.”***

*... “Inventing the Future” by Dennis Gabor, 1963  
(also attributed to Abraham Lincoln by many)*

There will be a financial gain because the Green First Team can develop a financing approach that creates the gain.

The detailed Case Study describes the technique First Universalist used to construct a funding approach that assembles the needed capital for the new energy equipment AND:

- 1) Does not require the church to pay an upfront cost, and
- 2) Maintains the same annual costs as the current fossil fuel system, and
- 3) Results in a financial gain over a 20-25 year period, and most importantly

4) Allows the church to stop contributing to global warming now - not 5 or 10 years from now when the existing fossil fuel equipment wears out.

The Green First Team found that if you can present a funding model to the Board/Vestry/Council for a new zero GHG emissions energy system that is “revenue neutral” (i.e., an approach that does not require a change in the organization’s budget), you will have the Board’s immediate attention. So, that became the goal. Any plan that increases the organization’s operating budget will make the path steeper to climb.

A “Revenue Neutral” funding approach serves as a baseline Life-Cycle Cost estimate for comparison with other ingenious funding approaches involving third parties (Power Purchase Agreements, Leases, PACE, Commercial Loans, etc.). The baseline also identifies the amount of sacrifice required by the congregation (if any).

### ***1.5% Interest Loan Background.***

After searching for several months without success for a third-party investor to fund their new ‘energy system’ that included both solar and geothermal equipment, the Green First Team finally gave up. It was then the self-funding models developed locally by Christ the Servant Lutheran, Louisville, CO and St. John’s Episcopal Church, Boulder, CO were discovered.

An informal poll by the Green First Team indicated that church members were “tapped out” as far as making further donations to the church. However, that same poll found some members would be willing to “loan” money to the church if they at least got back their principle.

Three Green First team members had been involved for several months over the 2015-2016 winter trying to figure out how to make a third-party LLC funding model work for their congregation. The St. John’s congregation created an LLC to fund their rooftop solar system that would provide 30% of electrical power requirements. The Green First Team had set a goal to fund a 100% solar system plus 100% heating & cooling system. The geothermal system made the traditional economics less attractive, but the Green First Team was insisting on an “all in” system now.

The Green First team also considered using an LLC made up of church members. It turned out that the LLC approach did not work as well at First Universalist Church Denver because the congregational demographics did not involved enough members with ‘passive income’ for the amount of capital needed to be raise.

As they struggled to find an LLC funding approach work for First

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Universalist, the team became aware of how onerous high-interest rate loans can be. The team could only make an LLC model work if their “investors” were willing to accept a minimal return on their investment (ROI). [Minimal means zero to 1%]

Nevertheless, the idea of self-funding was still a good idea, and the LLC morphed into a Partnership, as explained in the detailed Case Study. It is fair to say First Universalist Church would not have found their path without the new ways of thinking opened up by Christ the Servant Lutheran and St. John’s Episcopal Churches.

As recalled by one Green First Team member:

“After the Science Presentation, we put together a new cash flow model that included a donation option, a commercial loan option, and a member loan (1.5%) option. After trying various arrangements of donations/loans, we finally discovered a possible solution that seemed to work. It involved donations for about 40-50% of the capital required to buy the new energy system and the remainder as member loans at 1.5% interest rate. The result was a monthly repayment plan comparable to the current monthly budget for gas & electric.<sup>21</sup> A few changes were made, and a new spreadsheet funding model was created to define the cash flow over the next 20 years. The funding model confirmed there would be a significant financial gain by the church over a 20-year time frame, and the plan was ‘revenue neutral’ meaning it did not increase the church operating budget.”

The use of a combination of donations and low-interest (i.e., 1.5% interest) member loans seemed to emerge as a viable financing approach for First Universalist Church. (The commercial financing sector refers to this type of financing as “Impact Investing” or “Impact Lending.”<sup>22</sup>)

Unitarian Universalists were being encouraged to divest from enterprises that operated unsustainably (e.g., coal, oil, and gas related enterprises) by the UUA General Assembly Resolutions of 2006, 2013, 2014 and 2015 described earlier. Other environmental advocacy groups (e.g., 350.org – Fossil Free; Sierra Club – Beyond Coal) were suggesting Total Divestment. Total divestment means you stop feeding the monster financially - completely. Full Divestment means you stop buying their stocks, bonds, AND unsustainable products – a choice consistent with transitioning to zero GHG emission renewable energy sources.

For First Universalist Church, this meant:

- a) Stop investing in their stocks & bonds (The UUA had already reviewed its investments and eliminated its involvement in the fossil fuel burning industry),

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- b) At the church level, stop buying fossil-fuel generated electrical power (the local utility company still generated 80% of its electricity by burning coal and natural gas), and
- c) Stop buying/burning natural gas for heating the facility.

Members of the Green First team had also been influenced by the “Occupy Wall Street” movement in 2011. The “Occupy” movement identified several economic injustices and introduced alternative investment strategies. For example: divesting in Wall Street financial institutions (that were comingling banking functions and risky investment strategies); reinvesting using the concept of Slow Money (Socially Responsible Investing), and considering local institutions (e.g., local Credit Unions) and State Banks (e.g., North Dakota.) for banking functions. Keeping capital local to stimulate the local economy had become a thinkable alternative. So why not keep the financing for the new energy system local? Why not keep the working capital within the church community itself? Members could charge themselves low usury fees and keep the capital/wealth circulating locally.

Divesting totally from the fossil fuel burning industry and operating the church with renewable energy were seeds planted the previous year at a First Universalist Climate Change Workshop, “**Personal Response to Climate Change.**” Although the 2015 workshop focused on the personal level and what individuals can do to divest from and transition to renewable energy, the attendees spoke out during the closing feedback session. A few (3-4) asked why these same ideas were not being applied to the church renovation project that had just been initiated? Their voices were heard and the renovation project soon included a renewable energy system.

The low-interest member loan approach was aligned with several ideas advocated by the members of the congregation. For example:

- Avoid feeding Wall Street where possible. Income inequality & wealth inequality are already crippling this country.
- Avoid commercial usury rates where possible. Look for socially responsible investors who want to “put their money to good use” and invest in efforts that consistent with their values.
- Look for member investors & lenders who “want to promote a good cause that represents their values” instead of being focused on “making money.”
- Keep wealth within the local community where it provides local jobs. Better yet, retain the entire financial gain within the church community. If you have to pay any usury fees, pay it to yourself – to your church members.

### **Spreadsheet Analysis of the Funding Model.**

A relatively simple financial spreadsheet model similar to that shown in Figure 4 was used to construct a “Revenue Neutral” funding plan. Essential

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steps in designing a “Revenue Neutral” funding plan include the following:

- A. Analyze the cost of operating the existing fossil-fuel based energy system.
  - a. Include the monthly bills for the past year
  - b. Include all maintenance and replacement costs for the past year. For greater accuracy, you can look at the age and service life of the existing equipment (furnaces and A/C units) and determine the forward-looking replacement costs and use that instead.
  - c. Include a 3-4% escalation in the hydrocarbon-based energy costs.  
The analysis defines the baseline annual cost required to operate the existing hydrocarbon-based energy system.
- B. Estimate the size of the sustainable energy system. Knowing the size of the solar system and heat pump system required, it is possible to estimate the installation and operating costs.
- C. Assume it is possible to solicit low-interest (e.g., 1.5% interest) member loans from the congregation. Envision the money in the church budget earmarked for utility expenses being used differently. Envision that same amount of money used instead to finance a new sustainable energy system, specifically to service a loan repayment schedule. Determine the size of a 1.5% loan that can be repaid using the existing “utility” budget. Assume a 10 to 15-year term for the member loans.
- D. Subtract the loan value from the total cost of the energy system to define the size of the member donations and public grants required to create a Revenue Neutral funding model.

The spreadsheet model shown in will perform all these calculations when you input the necessary costs.

Figure 4 A 20 Year Life-cycle Cost Assessment Used for the First Universalist Sustainable Energy System Project.

RENEWABLE ENERGY SYSTEM PROPOSAL - REVENUE NEUTRAL									
MEMBER LENDER FINANCING "TRADITIONAL LOAN REPAYMENT"					RENEWABLE ENERGY SYSTEM COSTS				
FOSSIL FUEL ENERGY SYSTEM COSTS					RENEWABLE ENERGY SYSTEM COSTS				
Current Electric Annual Bill 13,146 (2012-2016 Average) Current Gas Utility Annual Bill 3,372 (2016 Actuals) New building saving 12% (1,926) Annualized Equipment Replacement Cost 2,813 Average Total 17,656					Solar Electric (GSW) \$125,000 Geothermal + 2 Etc. \$318,400 Total Equipment Budget \$443,400 Organization's Total Budget \$828,870 (Optional)				
100% Sustainable Energy System Cost 443,400 Dedicated Grants/Donations for Energy System 208,600 (47%) Financing with Member Energy Loan 235,000 (53%) Interest 22,574 Total Financing Cost 262,574 Annual Loan Payments (Traditional) 17,385					Renewable Energy System Costs \$125,000 Equipment Servicing \$318,400 Annual O & M \$1,310				
20 Year Life Cycle Cost (Renewable) 296,817 20 Year Life Cycle Cost (Fossil Fuel) 484,476 20 Year Cost Reduction with Solar/Geothermal 185,659					Organization's Total Budget \$828,870 (Optional) 15 year term @ 1.5% Interest Rate 3.0% Inflation / Energy Escalation Rate				
Year	Old Utility Bill Replacement plus	New Operating Cost	Member Loan Servicing	Cum Disbursement to Members	Renewable Energy Utility Bill	Cum Utility Cost	Reduction In Energy Expenses (Resources for other Programs)	Cum Cost Reduction	Energy % of Church Total Budget
1	2017 \$18,030	1,349	\$17,505	\$17,505	\$18,854	\$18,854	(\$624)	(\$824)	2.3%
2	2018 \$18,571	1,389	\$17,505	\$35,010	\$18,894	\$37,748	(\$630)	(\$1,454)	2.2%
3	2019 \$19,128	1,431	\$17,505	\$52,515	\$18,936	\$56,684	\$192	(\$955)	2.2%
4	2020 \$19,702	1,474	\$17,505	\$70,020	\$18,979	\$75,663	\$732	(\$232)	2.1%
5	2021 \$20,293	1,518	\$17,505	\$87,525	\$19,023	\$94,686	\$1,270	\$1,038	2.0%
6	2022 \$20,902	1,564	\$17,505	\$105,030	\$19,069	\$113,755	\$1,813	\$2,871	2.0%
7	2023 \$21,529	1,611	\$17,505	\$122,535	\$19,116	\$132,871	\$2,413	\$5,284	1.9%
8	2024 \$22,175	1,659	\$17,505	\$140,040	\$19,164	\$152,035	\$3,011	\$8,295	1.9%
9	2025 \$22,840	1,709	\$17,505	\$157,545	\$19,214	\$171,249	\$3,626	\$11,921	1.8%
10	2026 \$23,525	1,760	\$17,505	\$175,050	\$19,265	\$190,514	\$4,260	\$16,181	1.7%
11	2027 \$24,231	1,813	\$17,505	\$192,554	\$19,318	\$209,831	\$4,913	\$21,095	1.7%
12	2028 \$24,958	1,867	\$17,505	\$210,059	\$19,372	\$229,203	\$5,586	\$26,681	1.6%
13	2029 \$25,707	1,923	\$17,505	\$227,564	\$19,428	\$248,631	\$6,279	\$32,960	1.6%
14	2030 \$26,478	1,981	\$17,505	\$245,069	\$19,486	\$268,117	\$6,982	\$39,952	1.6%
15	2031 \$27,272	2,040	\$17,505	\$262,574	\$19,545	\$287,662	\$7,727	\$47,679	1.6%
16	2032 \$28,090	2,101	SO	\$262,574	\$2,101	\$289,763	\$25,989	\$73,668	0.2%
17	2033 \$28,933	2,164	SO	\$262,574	\$2,164	\$291,927	\$26,769	\$100,437	0.2%
18	2034 \$29,801	2,229	SO	\$262,574	\$2,229	\$294,156	\$27,572	\$128,009	0.2%
19	2035 \$30,695	2,296	SO	\$262,574	\$2,296	\$296,452	\$28,399	\$156,408	0.2%
20	2036 \$31,616	2,365	SO	\$262,574	\$2,365	\$298,817	\$29,251	\$185,659	0.2%
Total 20 Yr Fossil Fuel Costs \$484,476 Total Loan Payments \$262,574 Total 20 Yr Renewable Energy Costs \$296,817					Total Cost Reduction/Financial Gain \$185,659				

USER INSTRUCTIONS

- 1) Blue Cells indicate user inputs
- 2) Yellow Cell indicates calculated amount of capital to be raised in the form of donations/grants/rebates to transition to a Renewable Energy System.
- 3) Green Cell below the Yellow Cell indicates the calculated amount of member loans that are consistent with a revenue neutral financing model
- 4) Gold Cell in the bottom row highlights the financial gain in switching to renewable energy



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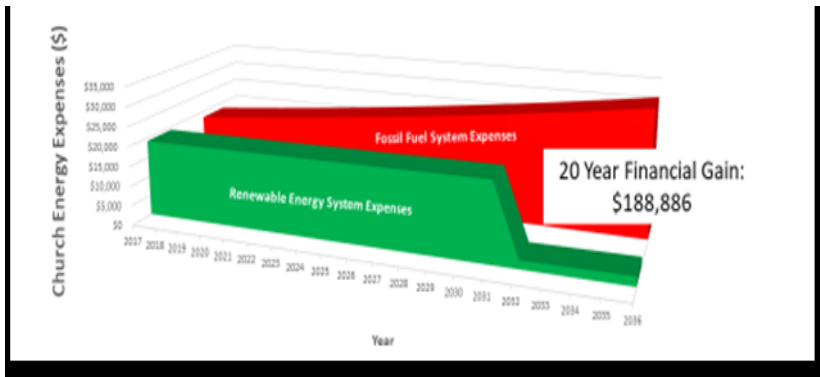


Figure 5 Comparison of Annual Expenses for operating a Fossil Fuel Energy System (RED) vs. a Renewable Energy System (GREEN) using a 20-year Perspective.

### Final Spreadsheet Analysis of the Funding Model.

The final financial assessment available for the November 2016 Congregational Meeting is provided in Figure 4. As indicated, the total cost of 100% sustainable energy system comprised of a 57 kW solar PV system and a 45 Ton rated ground source geothermal heating and cooling system and two ERVs was \$443,000. \$208,000 was raised as church member donations (and the member donors were able to use their donations as charitable deductions on their taxes). The remainder of the capital required for the energy system (\$235,000) was derived from member lenders who loaned the church money at a 1.5% interest rate repayable over a 15-year term.

This funding approach is considered to be “revenue neutral” from a church operating perspective. In other words, the church is currently spending a certain amount of money on gas and electric. There is a line item in the operating budget to cover these energy-related expenses based on gas and electric purchases from the local utility company, Xcel Energy. Using a fuel mix of approximately 80% fossil fuel generated and 20% from renewable energy sources, the church utility annual bills based on a fossil fuel energy system was around \$13,146 for electric and \$3,372 for natural gas plus \$2912 for annualized equipment replacement costs for a total of \$19,430.

The church expects to save money by switching from compact fluorescent to LED lighting and the new windows, and added insulation should reduce heating/cooling costs, so they expect at least a \$1,900 reduction in energy costs due to New Building Savings.

The renovated facility must comply with the current building code that now includes a new fresh air ventilation requirement for public spaces. This requirement increases energy usage.

The adjusted utility cost going forward with the renovated building was estimated to be \$17,500. This is an important number to start with because it determines the size of the loan that the church can service without changing the budget.

The goal was to create a financial model that was revenue neutral – meaning there would be no upfront down payment and no change in the church operating budget.

The spreadsheet model allows the user to stipulate the current annual utility bill and the cost of installing a new renewable energy system (e.g., a 100% sustainable system with zero GHG emissions) and then **calculate the amount of donations/grants that are required to end up with a “revenue neutral” funding model.**

#### Revenue Neutral Funding Model

<http://coloradointerfaithgreenbuilding.org/Solar-GeoFundingModelA.pdf>



<http://coloradointerfaithgreenbuilding.org/Solar-GeoFundingModelA.xlsx>



The model is simple. It can be “reverse engineered” just by inspection or downloaded. Here’s how it works.

- 1) Input current electric and natural gas annual costs. Input the estimated cost of the new energy system (solar system and heat pump system). Input expected annual operation and maintenance cost, input estimate annual cost to replace aging equipment.
- 2) If the new energy system is being installed along with some energy conservation/ energy efficiency improvement, estimate the annual savings,
- 3) Start with a plan to use low-interest (e.g. 1.5%) member loans to finance a portion of the new energy system. Depending on your member lenders, a 10, 15 or 20-year term for the member loans can be selected (e.g. start with 15 years)
- 4) Assume an escalation rate for the cost of fossil fuel derived energy.

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Colorado data has shown a 4-5% annual increase over the past 20 years – it is reasonable it can increase that much over the next 20 years.

- 5) Examine the model results. The yellow cell indicates the amount that must be raised in the form of donations/grants/rebates to reduce the effective cost of the system sufficiently to allow the balance to be covered by low-interest loans defined in the green cell below the yellow cell. The combination of the yellow cell and the green cell should be the total cost of the new energy system.
- 6) The gold cell at the bottom of the table provides an estimate of the expected financial gain in transitioning to renewable energy – in this instance over \$185,000.

Before moving forward to solicit church members for loans, the approach needed to be reviewed by the entire Green First Team, the BFF Committee, the Board of Trustees and the Staff to get their suggestions and approval.



#### 5. Solicit Funds: Donations/Loans/Leases

**B**ased on the Green First Team experience, it appears that members of the Green Team are likely to be involved in soliciting funds for their new zero GHG emission energy equipment.

As expected, the commitment and resolve of the Green First Team translated into significant financial support by these few members. They provided a disproportionate, but critical, amount of support that launched the capital campaign for the new energy system with a notable lift-off.

The following situation occurred at First Universalist Church Denver. The congregation had just finished a significant capital campaign to raise funds for a \$4.5 M renovation project that included a new energy system with zero GHG emissions. That capital campaign ended with a shortfall of nearly \$1M. In response to that shortfall, the new sustainable energy system was deleted from the remodeling project, but the Green First Team was authorized to seek “third party” funding for the new energy system subject to approval by the Board.

After failing to identify any third party financing, the Green First Team turned to re-soliciting the congregation for funds to install a new energy system.

The Green First Team encouraged members to divest from fossil fuel enterprises and related infrastructure and re-invest locally, e.g., in helping the church transition to a 100% sustainable energy system.

The Green First Team members involved in soliciting funds would approach potential donors personally. When asked to support the new energy system, many church members said, “Sorry. We know this is a good cause, but we are tapped out for donations.” So the “ask” turned into, “Would you be able to loan the church money at a low-interest rate?” - As a low-risk socially responsible investment? Surprisingly, there was often a positive response to that request. So much so that pledges for loans to the church exceeded the amount that could be serviced by “utility costs.” However, the total amount raised was getting closer to the goal. Ironically, as the amount raised got closer to the goal, more congregants found they too could donate.

When the amount raised reached 80-90% of the goal, The Green First Team decided to take their proposal for a new sustainable energy system to the Board for review and possible approval.

The Green First Team was persistent and consistent. Every chance they had to communicate with their fellow congregants, their message would be the same. They started with a reminder of their common faith-based values and then appealed to secular motivations appropriate for that individual.

The Green First Team did spend a significant effort describing how it was possible to renovate the existing facility to be consistent with the professed values they all had in common. In effect, they described what was required to make the facility sacred.<sup>23</sup>

In many cases, it was appropriate to explain the Life-Cycle Cost analysis because it indicated this project was a “smart” investment as well as the “right thing to do.” The Green Team would explain how members could finance this project if they are willing to be Socially Responsible Investors interested in having their money used wisely for a good cause. They mentioned that it appeared to be possible to finance this project without commercial loans - without involving Wall Street. They pointed out that this church project would create new local jobs and help keep the money they pledged (donated or loaned) circulating locally.



## 6. Obtain Board / Congregation Approval

Obtaining the approval of the Board/Vestry/Council is essential for all faith-based and mission-oriented non-profit organizations in the early stages and throughout.

At First Universalist Church, the process of obtaining approval from the Board of Trustees to transition from fossil fuel to renewable energy was difficult. Though half of the Green First Team had served on the Board in the past; none had proposed such a large project to the Board before. In that sense, the Green Team was inexperienced. The approval process was probably more complicated than necessary because the Green Team did not initially discuss an approach or strategy for gaining Board approval. They jumped in, tried something, and then responded to the Board feedback.

### **Characteristics of the New Energy System Proposal.**

In retrospect, based on what eventually evolved, the Green First Team would have had an easier time if the initial proposal for a new energy system included the following characteristics at the very beginning rather than the end:

A proposal that allows the organization to operate in a manner that is consistent with the denomination’s faith-based values (i.e. “living your values”) is difficult for the Board to reject.

A proposal that does not require up-front money and does not change the church operating budget is difficult for the Board to reject.

A proposal that transitions from fossil fuel to renewable energy and results in financial gain for the church is difficult for the Board to turn down.

A proposal that has a uniqueness that the congregation can hold up with pride and a sense of accomplishment will attract positive attention from the Board. For example, a “100% Sustainable Energy System”; a “Zero GHG Emission Energy System”; a (Net) “Zero Carbon Emission System” to suggest a few, makes the project notable and more attractive.

A proposal that allows the congregation to proclaim proudly, “We are still in” [the Paris Agreement] also sends a positive, affirmative message to the youth in the congregation. Such a proposal indicates the church is extending itself for the spiritual growth of its children.<sup>24</sup> This is also hard for the Board to reject.

Although the final proposal submitted to the Board eventually contained these elements, it would have been easier if the initial proposal had included

these elements at the beginning.

### **Board / Green Team Interaction & Communication.**

Although the renewable energy system was a separate project, it was folded into a larger renovation project for project management purposes. As a result, the Green First Team first had to seek approval from the Building Committee before getting approval from the Board. This was problematic, as explained in the detailed Case Study.

Nevertheless, the first presentation the Green First Team made was a proposal for a 100% sustainable energy system to the Building Committee. Several Board members attended. After the presentation, one Board member volunteered to help the Green First Team modify their proposal so that it would be more acceptable to the Board.<sup>25</sup> Having a liaison with the Board turned out to be invaluable.

After the first formal presentation to the full Board, another Board member volunteered to help coordinate issues between the Building Committee and the Green First Team as well as between the Board and the Green Team. This offer to help evolved into an ad hoc committee called the Renewable Energy Working Group (REWG) chaired by a Board member. The REWG was comprised of representatives from the Board, the Staff, the Board’s two Independent Reviewers, the Building Committee, and the Green Team.

As a result, several Board members were now directly involved in finalizing the design of the new energy system as well as developing the financing approach. This ongoing involvement of Board members in preparing the final proposal to the Board was a key factor in gaining Board approval.

### **Approval Strategy.**

The relatively inexperienced Green First Team did not discuss their approach or strategy for seeking Board approval.<sup>26</sup>

The Green Team did, of course, share the same faith-based or mission-oriented values. Beyond that, the Board’s perspectives and the Green Team’s perspective were different - initially.

Based on the First Universalist experiences, it appears helpful to:

- Include a Board member, at least informally, on your Green Team. They will be invaluable in preparing your proposal to the Board.<sup>27</sup>
- In the event, the Board does not include STEM members, suggest they solicit several STEM congregants to serve as Independent Reviewers of

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the project who report directly to the Board.

- Plan on numerous briefings /meetings /and email exchanges to address the Board’s questions and concerns.
- Make a list of Frequently Asked Questions (FAQ) with appropriate Answers. This will save some time and correspondence.
- Cite examples of similar organizations (e.g., churches) who have successfully installed similar systems.

### **Understand the Board’s Perspective.**

Based on the Green First Team’s experiences, it appears crucial to understand the perspective of the Board / Vestry /Council for effective communication. Based on observation, it seems the Green First Team spent little if any time understanding the Board’s perspective.

For example, it was difficult for the Green First Team to acknowledge the Board’s primary focus was on the current year budget - not the long-range 20-year perspective that the Green Team was focused on and prepared to present.

- When the Green First Team presented their proposal to the Board, the Board was already struggling with a budget shortfall in the operating budget of around \$40,000 for the current year.
- In 2 years, most if not all of these members will not be serving on the Board/Vestry/Council, so the 20-year perspective is not their primary concern.

The Green First Team did not appear to acknowledge that some members of the Board were not financial experts. As a result, the Team did not provide an adequate explanation of a Life-cycle Cost analysis.<sup>28</sup> So part of the challenge for a Green Team is to introduce to the Board the importance of a life-cycle cost assessment.

### **Presentation to the Board of Trustees (5 Jul 2016)**

Before this presentation, the Board had received the Green First teams’ written response to their questions the day before. The amount of time to present the proposed energy system and funding plan was limited. Because the Board Meetings generally have a full agenda, the Green First Team selected a single spokesperson to provide the same information presented two weeks earlier to the BFF Committee and two Board representatives.

In the past three weeks, additional donations and loan commitments had been made. The “Approach” chart and spreadsheet model were updated to reflect these new pledges. As indicated, donations now totaled \$105,000,

and member loans were now \$220,000. The first time the Green First Team presented their proposal to the Board, **Two-thirds (2/3) of the capital required for a new energy system had already been pledged.** So the presentation was a status report and not a final report.

## Approach



- Lease Solar (Pre- Paid PPA) & Buy Geothermal
- We have \$105,000 in pledges as “seed money”
  - **We plan to raise an additional \$40,000**
- We will need \$335,000 in loans
  - Spread sheet assumes \$270,000 in member loans at 1.5% interest
  - We have loan commitments for \$220,000.
  - **We plan to get at least \$50,000 more member loans.**
  - **We anticipate borrowing \$65,000 commercially at 5.0 % interest**  
(Board Action Required)
- Current “utility bills” (\$19,875 / year) will be redirected to loan payments
- See cash flow spreadsheets for details for 20 years



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The spreadsheet model in Table 4 illustrates the 20-year cash flow with this funding model.

Figure 6 summarizes the 20-year annual payment profile (shown in green) that was designed to be the same as the projected utility bills (shown in red). A 4% / year escalation in expenses was assumed (sum of inflation and rising energy prices.) The escalation rate became a very contentious assumption as discussed later.



Table 4 Baseline Proposal to Board Showing a Plan with 81% Member Financing (81%) and a Commercial Loan (19%)

BASELINE PROPOSAL		"MAINTAIN EXISTING UTILITY PAYMENTS"		MEMBER LOAN FINANCING -		COMMERCIAL LOAN -			
Current Electric & Gas Utility Annual Bill		\$16,019	(2015 Actuals)						
Annualized Equipment Replacement Cost		\$3,250	3a/ (Ref: ASHRAE)						
Total		\$19,269							
"MAINTAIN EXISTING UTILITY PAYMENTS" SCENARIO				10.0%		19%			
100% Sustainable Energy System Cost		\$480,000		Fraction of Total Renovation Project Cost					
Additional cash contribution		\$40,000		1%		Additional Cash Contributions from BFF			
Dedicated Pledges for Energy System		\$395,000	(22%)	2%		Inflation rate			
Financed by Member Energy Loan		\$270,000	81%	1.5%		Fuel cost escalation			
Financed by Commercial Energy Loan		\$65,000	19%	5.0%		Interest Rate			
20 Year Life Cycle Cost (Renewable)		\$426,670				Interest Rate			
20 Year Life Cycle Cost (Fossil Fuel)		\$620,615				Total Loans			
20 Year Savings with solar/Geothermal		\$199,945							
Year	Fossil Fuel Utility Bill plus Replacement	New Operating Cost	STATUS REPORT	New Utility Bill	Deferred payments	Interest payments by church	Cum Utility Cost to Members	Cum Disbursement to Members	Annual Payout on loans / 1k Share
2017	\$20,841	\$1,336		\$20,841	(\$6,775)	\$1,401	\$20,841	\$13,337	\$49
2018	\$21,675	\$1,353		\$21,675	(\$5,968)	\$1,485	\$40,516	\$27,481	\$52
2019	\$22,542	\$1,390		\$22,542	(\$5,128)	\$1,574	\$65,058	\$42,464	\$55
2020	\$23,444	\$1,418		\$23,444	(\$4,255)	\$1,665	\$88,502	\$55,332	\$59
2021	\$24,381	\$1,446		\$24,381	(\$3,345)	\$1,761	\$112,889	\$75,089	\$62
2022	\$25,357	\$1,475		\$25,357	(\$2,399)	\$1,860	\$138,200	\$92,802	\$66
2023	\$26,371	\$1,505		\$26,371	(\$1,414)	\$1,964	\$164,611	\$111,500	\$69
2024	\$27,426	\$1,535		\$27,426	(\$5,989)	\$2,071	\$192,037	\$131,223	\$73
2025	\$28,523	\$1,566		\$28,523	\$677	\$2,183	\$220,560	\$152,012	\$77
2026	\$29,664	\$1,597		\$29,664	\$1,787	\$2,300	\$250,223	\$173,911	\$81
2027	\$30,850	\$1,629		\$30,850	\$2,941	\$2,421	\$280,074	\$196,964	\$85
2028	\$32,084	\$1,661		\$32,084	\$4,143	\$2,547	\$313,158	\$221,219	\$90
2029	\$33,368	\$1,695		\$33,368	\$5,393	\$2,678	\$346,526	\$246,723	\$94
2030	\$34,702	\$1,729		\$34,702	\$6,694	\$2,815	\$381,228	\$273,529	\$99
2031	\$36,090	\$1,763		\$36,093	\$8,040	\$2,956	\$417,311	\$301,681	\$104
2032	\$37,534	\$1,798		\$37,538	\$0	\$0	\$454,910	\$301,681	\$0
2033	\$39,035	\$1,834		\$39,039	\$0	\$0	\$492,944	\$301,681	\$0
2034	\$40,597	\$1,871		\$40,597	\$0	\$0	\$531,415	\$301,681	\$0
2035	\$42,221	\$1,908		\$42,221	\$0	\$0	\$570,324	\$301,681	\$0
2036	\$43,910	\$1,947		\$43,910	\$0	\$0	\$609,670	\$301,681	\$0
Total Loan Payments		\$32,466	\$92,523	\$301,681	\$301,681	\$31,681	\$426,670	\$426,670	
Savings									
Total Loan Payments		\$32,466	\$92,523	\$301,681	\$301,681	\$31,681	\$426,670	\$426,670	
Savings									
Total Loan Payments		\$32,466	\$92,523	\$301,681	\$301,681	\$31,681	\$426,670	\$426,670	

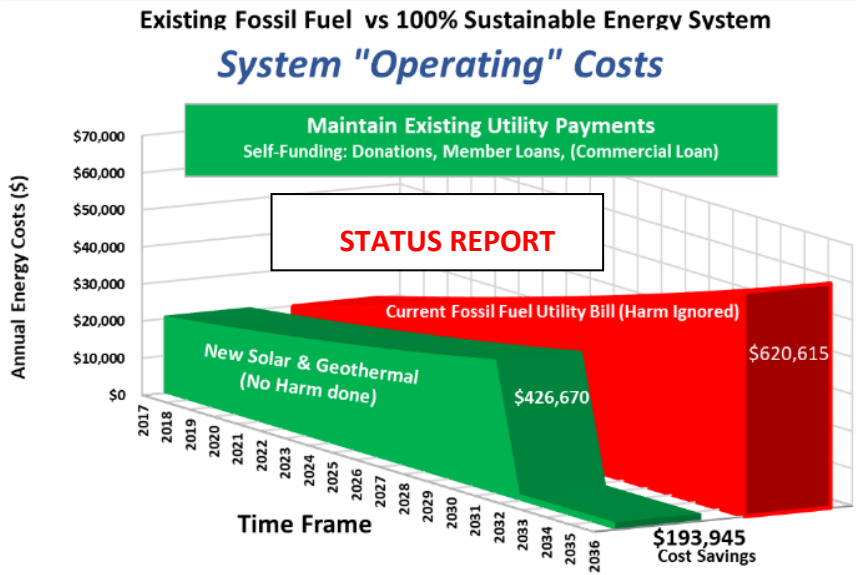


Figure 6 Summary of the proposed energy system 20-year cost profile compared to fossil fuel system cost.

## Summary and Conclusions



- Lease Solar & Buy Geothermal and finance with member contributions & loans and, if necessary, supplement with commercial loans.
  - \$105,000 contributions and \$220,000 loans committed to date.
- Green First unanimously recommends maintaining both the solar and geothermal components
  - Our stated financial commitments would have to be reexamined without the geothermal component
  - We should be as responsible as many other UU churches (and IKEA).
- We think there should be an opportunity for everyone to contribute something, no matter how small.
- The church will have a stable and predictable "utility budget" protected against fuel cost growth, carbon taxes, etc.
- Installing a 100% Sustainable Energy System (at no added cost to church operations) will give our UU youth hope that adults are actually doing something to reduce climate change/global warming.

### Part III: “GreenNotes” Version

After this presentation to the Board and the meeting was adjourned, one Board member approached a small group of the Green First team and indicated that he would be willing to help them work things out with the Board. Two members of the ten-member Board now seemed to see merit in the proposed sustainable energy system plus two of the six members of the Building Committee. The circle of support was growing slowly.

Roughly 2/3 of the capital had been pledged but there was still work to do to raise the remaining 1/3 – including several new Board requirements yet to be identified.

#### Preparation for the Congregational Meeting

After approval of the Board / Vestry /Council Obtaining, the approval of the Congregation is expected to be less challenging. By now, a significant number of the congregants had already become aware of the proposed solar and geothermal energy system because they had been asked to support it financially. Roughly 10% of the members had donated to or invested in the new energy system.

However, taking nothing for granted, a series of three Town Hall meetings were scheduled after the Sunday service specifically to address any congregants concerns. Members who wanted to learn more about the proposed sustainable energy system could attend any one of these meetings, ask questions, and express their concerns.

The Green First Team also sponsored a Geothermal 101 workshop as a Community Forum for those members who were just curious about how a geothermal heat pump works. (Spoiler Alert: They were underwhelmed to learn the proposed heat pump technology was nothing more than a larger version of their refrigerator at home, with a reversing valve so it could provide heating as well as cooling. Sometimes being underwhelmed is a good thing; this was one of those times.

These “Informational/Educational” events were attended by 20-30 congregants. People attended who were curious or concerned about the proposed new energy system. The Green First Team judged the Town Hall meetings and other like events to be successful, because, on November 6, 2016, **the congregation voted unanimously to go forward with the 100% sustainable energy system.**



## 7. Select Certified Designers and Installers

After Congregational approval, the Team effort began focusing on finalizing the financing approach and the detail design of the energy system so construction and commissioning could proceed.

After the Congregational approval, two activities were set into motion:

1. a separate contract was finalized for installing the solar PV system, and,
2. the construction contract was modified to install the geothermal system.

The Green First team emphasis changed from convincing others this is “the right thing to do” to making it happen and “doing the thing right.” In other words, the focus turned to the technical aspects of the project – the final design, procurement, permitting, construction, and commissioning of the new energy system.

Solar photovoltaic technology is well established globally. Reputable, experienced solar PV installers can be readily found in the area. The solar modules (panels) are typically imported from Asia and Europe at the moment. Workmanship inspections by public building inspectors are performed as an integral part of the construction permitting process.

The Heat Pump technology is well established in European countries, but less so in the U.S. Nevertheless, certified, experienced installers can be found locally for both air-source heat pump systems and ground-source (geothermal) heat pump heating and cooling systems. There is an International Ground-Source Heat Pump Association (IGSHPA) that provides a certification program. The Green First Team insisted on using IGSHPA certified designers and installers. The typical construction permitting process does not include quality inspection of the geothermal system, so an independent Commissioning Agent was hired by the Green First Team to verify the installation.



## 8. Utilize Experienced Commissioning Agents

Solar and Geothermal systems are relatively sophisticated technologies. Validation of quality and operational performance is best done by experienced personnel. The Commissioning team identified numerous HVAC control issues that were then resolved as in-scope work.

The need for a Commissioning Agent was not identified until late in the project and became a contract add-on.



## 9. Monitor System performance carefully for a year

It is important to monitor the energy system performance, at least initially, to assure it is operating correctly. Although the energy system operation was verified by a separate Commissioning Agent, several minor adjustments were made later.

The Green First Team did not think far enough ahead in the area of Operation and Maintenance of the new energy system. As a result, the installation contract did not include a comprehensive performance monitoring system. A performance monitoring system was added after commissioning to observe the system operation and help manage/conserves energy.

Fortunately, by the end of the project, there were enough STEM members of the congregation that were now advocates of the new energy system that it was possible to use in-house talent to install a monitoring system (in retrospect, this was probably a less expensive approach because it used volunteer labor.)

After the building was thoroughly inspected and certified for occupancy, several members of the Green First Team installed the energy system performance monitoring instrumentation. Cat 5 wires had been pulled to each of the ten furnaces and five ERVs the previous fall before drywalling was completed in anticipation of the monitoring systems.

Two monitoring systems were installed to observe the performance of the energy system.

- **eGauge** for measuring the power usage of critical items. See [egauge41397.egaug.es](http://egauge41397.egaug.es)
- **Web Energy Logger (WEL)** for measuring/recording geothermal system temperatures. See [www.welserver.com/WEL1022/](http://www.welserver.com/WEL1022/)

Over approximately one week in April 2018, 70 sensors were installed to monitor air and water temperatures. In May of 2018, eighty (80) CTs (current transformers) were installed in five circuit panels around the facility to measure power usage from significant energy users.

City Electric activated the solar system on 6 June 2018, and the new energy system began producing electrical power.

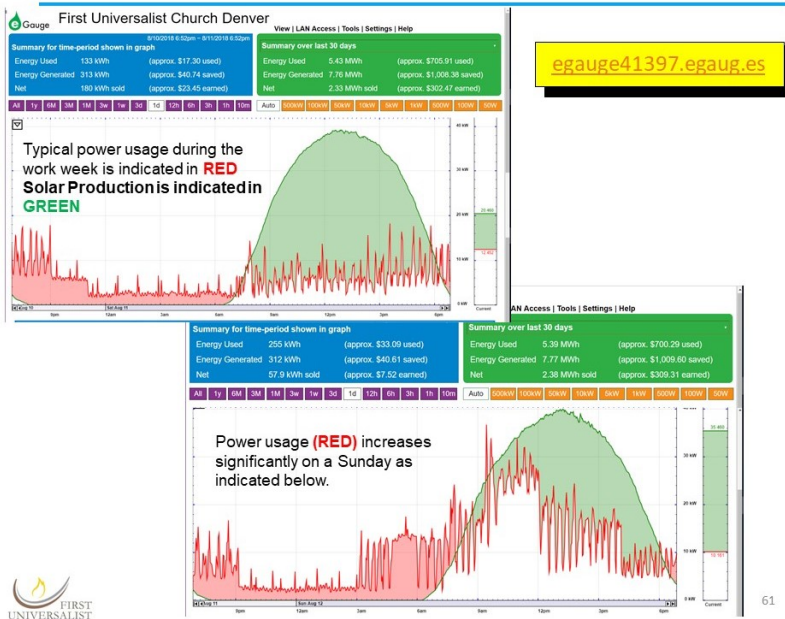


Figure 7 eGauge display showing Energy Usage midweek and on Sunday in RED. Solar PV power generation is shown in GREEN

The eGauge monitoring system records and displays the power generation and usage of the church. The green profile in Figure 7 illustrates the power (green) generated by the rooftop solar PV system over 24 hours. The red profile is a record of the total power usage of the church facility during that day.

The upper half of the chart shows a typical August weekday. The lower chart illustrates the increased usage associated with the Sunday morning services. Although solar production is similar (i.e., peaks at just under 40 kW around 1:00 pm), the energy usage is significantly higher on Sunday as expected. For that particular week, the net energy was positive – i.e., the church harvested sunlight and generated more electrical power than it used.

The WEL monitoring system records and displays are operating temperatures of the ten heat pump furnaces and five Energy Recovery Ventilators (ERVs) throughout the facility. Incoming and outgoing water and air temperatures are measured, recorded, and displayed on a web site. The information is then displayed real-time (and available via the internet) on the graphic below.

## Part III: "GreenNotes" Version

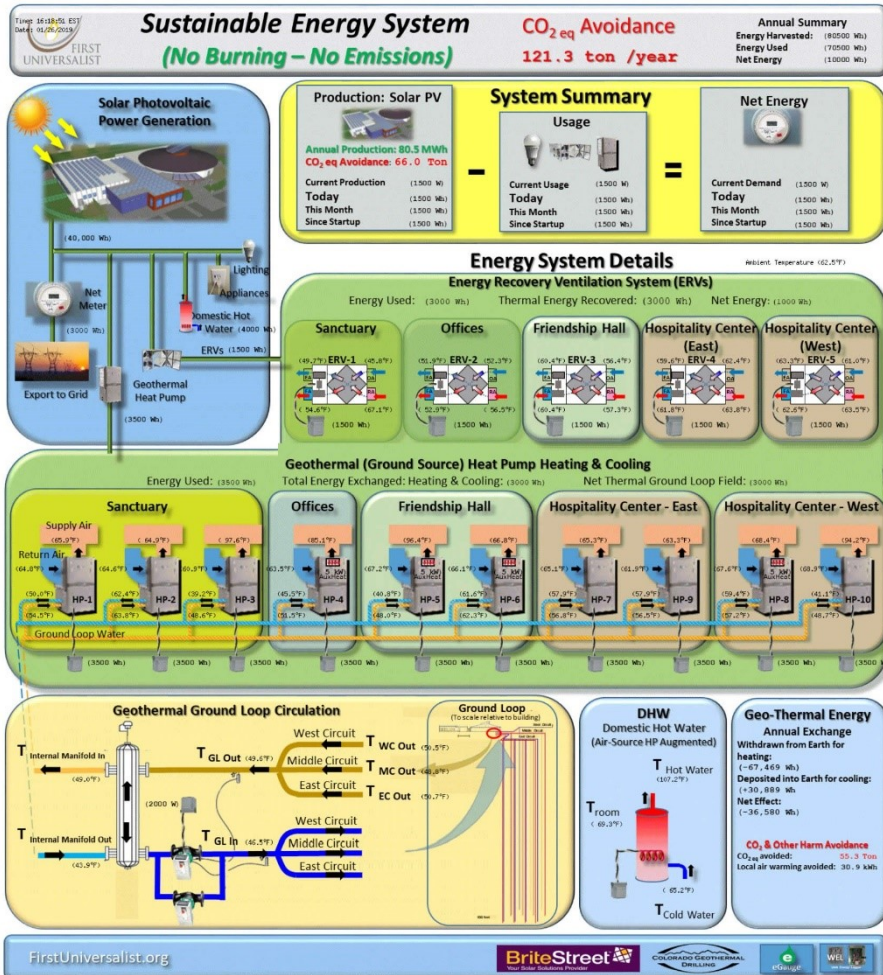


Figure 8 WEL Temperature Monitoring System

## 10. Pay it Forward.

Do help pay it forward and serve as a resource for other organizations who are thinking about reducing their emissions. Even if you have just started along the path to zero GHG emissions, your story is worth sharing – particularly with those who have yet to start.

There are countless ways to pay it forward; only a handful will be mentioned here as examples:

- Tell your story to others in your faith denomination – your experiences can be translated easily to their congregation because they will understand

your faith-based motivations;

- Document your account for publication in your denomination’s newsletters;
- Offer to speak about your successes to groups in other congregations including interfaith groups;
- Plan or host seminars, workshops, meetings, conferences where like-minded people can gather and learn about the climate crisis and how they too can transition their facility to operate with zero emissions; using renewable energy
- Offer to help as a consultant or advisor.
- If you have started, you are leading the way for others we have not.

### **Conclusions**

- Transitioning to a 100% sustainable (renewable) energy system results in financial gain – even for non-profit organizations.
- Replace all GHG emission sources together as a total system.
- Seriously consider local/member financing. Keep the jobs and the wealth in your community.
- Do not hesitate to ask for help from other non-profit organizations who are on their path to zero GHG emissions.
- Do not forget to share your difficulties and successes with others.





# Conclusions / Summary

The Green First Task Force began exploring the addition of rooftop solar on the church in 2011. That effort was put on hold because discussions were initiated to make major changes to the church facility. Persistent roof leaks, parking lot repairs, aging equipment, lack of space for growing church membership, etc. initiated serious discussions ranging from selling the building and buying another, to scraping the current lot and building a new building, to remodeling the existing building. A committee to explore options was formed in Feb 2013. Their assessment recommended a major remodeling project for the existing facility. The congregation voted to launch a building renovation effort in May 2014.

A Sustainability Subcommittee was formed to advise the BFF leadership. Although a solar PV system was on the initial request list, a geothermal/ground source heat pump heating and cooling system to replace the ten natural gas burning furnaces was not added as a renovation consideration until August of 2015 – a year later. In September 2015, the BFF Building Committee drew up a new “Sustainability Framework” that included both solar electric and geothermal heating and cooling.

The fundraising campaign to raise the capital for the remodeling project successfully raised what a UUA consultant from Boston had estimated the church could expect. However, the amount of money pledged was significantly less than the total cost of the proposed remodeling project. As a result, several features were deleted from the building project to reduce the cost. The renewable energy system was among those items that were removed. On April 3, 2016, the congregation voted to move forward with the revised remodeling project without financing a new energy system. However, that same vote authorized the pursuit of third-party financing for a sustainable energy system.

The Green First Task Force took on the challenge of pursuing third-party funding, and after evaluating several possible financing, scenarios found one that appeared promising. A member of the Board of Trustees advised the Green First Task Force that the funding approach must be considered ‘revenue neutral’ and not require any change to the annual operating budget. An ad hoc Renewable Energy Working Group (REWG) was formed and chaired by a Board member. The REWG worked to resolve remaining technical and make

## Conclusions/Summary

adjustments to the financial approach, so it was agreeable with the Staff and Board of Trustees.

The Board approved the proposed funding approach in Oct 2016. The necessary capital was raised internally using a combination of member donations and low-interest member loans. The loan repayment plan, designed to be lower than the current operating budget for utilities, was taken back to the congregation for approval – which they did unanimously on November 6, 2016.

Construction of the new energy system began June 21, 2017, with the drilling of the first borehole for the external ground loop for the geothermal system. The ground-loop heat exchanger system was complete within a week. The internal equipment for the geothermal system was installed and connected to the heat pump furnaces in October 2017. The renovation was sufficiently completed by 24 December 2017 to move back in and hold the Christmas Eve service.

The solar PV system was installed in Mar 2018. Xcel installed the net meter on June 1, 2018. The solar PV system was activated by City Electric and began producing power on June 6, 2018.

Transitioning to a solar and geothermal energy system is expected to reduce the 20-year life-cycle operating cost (for electrical power plus heating and cooling) by over \$180,000.

The new sustainable energy system has zero carbon emissions. As a result, the congregation avoids dumping over 100 tons of CO<sub>2</sub> eq into the atmosphere annually and complies with the 2015 Paris Agreement and the 2018 IPCC 1.5C Report.

**Left to Do.** To reach the goal of Net-zero GHG Emissions, First Universalist still has work to do. The kitchen uses a natural gas burning stove. The exhaust hood includes a make-up air heater that burns natural gas to warm incoming cold air. Zero waste is still a challenge. Recycling / composting food waste is still in-work. There are no electric vehicle charging stations for the Staff or congregants – transportation has yet to be addressed. Utilizing the “grounds” in a sustainable manner (so it harvests sunlight and serves as a regenerative system) has yet to be addressed.



## Acknowledgments

With gratitude, we acknowledge the many who gave their time and talent to put the church on a path to transition from unsustainable energy (i.e., burning ancient hydrocarbons) to a sustainable inexhaustible energy system (solar and ground-source geothermal energy) with zero GHG emissions.



Architect's Rendition - Oct 2015



Drone Photo - April 2019

With gratitude, we acknowledge the Green First Task Force including: Tom Abood, Craig Murray, Toni Nading, John Bringenberg, Milt Hetrick, Jonathan Ormes, Jan Ormes, Rev. Gail Collins-Ranadive, and most recently Linda Baggus, Hilary Morland, and Gary Norton.

We also acknowledge the First Universalist Church of Denver staff, specifically Jessica Montgomerie, for assistance in documenting this Case Study.



## Endnotes

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<sup>1</sup>4249bl.blackbaudhosting.com,<https://4249bl.blackbaudhosting.com/blog/post> (accessed July 31, 2019).

<sup>2</sup> The “GreensNotes” Version is patterned after the idea of SparkNotes or CliffsNotes in that it represents a very condensed version of the parent document, in this case the parent document is “Transitioning a Faith-based Facility to Sustainable Energy: From the Ground Up Using Solar Electric and Ground-Source Heating & Cooling – A Case Study: First Universalist Church, Denver Colorado.”

<sup>3</sup> There are an estimated 800,000 Unitarian Universalists around the world; around 200,000 in the U.S.

<sup>4</sup> UU Seventh Principle: “Respect for the interdependent web of all existence of which we are a part.” <https://www.uua.org/beliefs/what-we-believe/principles/7th>

<sup>5</sup> Joanna Macy | Americans Who Tell The Truth, <https://www.americanswhotellthetruth.org/portraits/joanna-macy> .

<sup>6</sup> Paris Agreement. <https://unfccc.int/process-and-meetings/the-paris-agreement/the-paris-agreement>

<sup>7</sup> For more information see: <http://climate-l.iisd.org/news/indc-analyses-show-improvement-need-for-radical-action/>

<sup>8</sup> <https://www.uua.org/environment/sanctuary/old/steps/justice/293262.shtml>

<sup>9</sup> <https://www.uua.org/environment/sanctuary/steps/plan/290993.shtml>

<sup>10</sup> <https://www.uua.org/environment/sanctuary/steps/plan/292488.shtml>

<sup>11</sup> <https://www.uua.org/environment/sanctuary/steps/plan/292494.shtml>

<sup>12</sup> Consider Divestment in Fossil Fuel.

<https://www.uua.org/action/statements/consider-divestment-fossil-fuel-industry>

<sup>13</sup> Reference: ***Faith-Based Statements on Climate Change***, published by Citizen Climate Lobby and Citizens' Climate Education, Coronado, CA, 2015 (second edition). [https://issuu.com/citizensclimatelobby/docs/faith-based\\_statments](https://issuu.com/citizensclimatelobby/docs/faith-based_statments)

<sup>14</sup> IPCC Global Warming of 1.5°C, <https://www.ipcc.ch/report/sr15/>

<sup>15</sup> Billion-Dollar Weather and Climate Disasters: Overview, <https://www.ncdc.noaa.gov/billions/>

<sup>16</sup> The Green First team was formed around 2007 as part of an initiative to raise the awareness of the congregation about sustainable living by engaging in the UUA Green Sanctuary accreditation program. To become a certified Green Sanctuary, requires educational as well operational changes within the church. First Universalist completed their accreditation program in 2010.

<sup>17</sup> STEM. Denotes people involved in Science, Technology, Engineering and/or Mathematics.

## Endnotes

<sup>18</sup> *“Full cost accounting for the life cycle of coal”* Paul R. Epstein, Jonathan J. Buonocore, Kevin Eckerle, Michael Hendryx, Benjamin M. Stout III, Richard Heinberg, Richard W. Clapp, Beverly May, Nancy L. Reinhart, Melissa M. Ahern, Samir K. Doshi, and Leslie Glustrom. 2011. in “Ecological Economics Reviews.” Robert Costanza, Karin Limburg & Ida Kubiszewski, Eds. Ann. N.Y. Acad. Sci. 1219: 73–98.

<sup>19</sup> Lynne Twist, *“The Soul of Money,”* 2017

<sup>20</sup> Naomi Klein, *“This Changes Everything-Capitalism v The Climate,”* 2014

<sup>21</sup> This approach incorporate three suggestions from church members. 1) consider “Slow Money,” 2) consider local capital, and 3) consider a “revenue neutral” approach that did not require a change in the church operating budget.

<sup>22</sup> What is Impact Investing? ... investing that aims to generate specific beneficial social or environmental effects in addition to financial gain. Impact investing is a subset of [socially responsible investing](#) (SRI). ‘Socially responsible’ investing encompasses avoidance of harm; ‘impact’ investing actively seeks to make a positive impact. For example, by investing in non-profits that benefit the community or in clean technology enterprises. The basic goal of impact investing is to help reduce the negative effects of business activity on the social environment, and it can be considered an extension of philanthropy. [Ref: <https://www.investopedia.com/terms/i/impact-investing.asp> , James Chen, 2018]

What is an Impact Loan? A financial tool for businesses who measure and are committed to improving their social and environmental impact. Established small business owners who focus on the Triple Bottom Line (People, Planet, Profit) and are committed to becoming B Corp Certified are eligible to access Impact Loans. The Impact Loan is meant to incentivize and reward for-profit businesses who focus on their social and environmental impact. Through Impact Loans, entrepreneurs will be rewarded with flexible terms, and lower interest rates. Entrepreneurs who receive the Impact Loan are committed to submitting for B Corp certification within 12 months of funds being disbursed. Ref: <https://assetspa.org/programs/social-impact-loan/>

<sup>23</sup> The origin of the word sacrifice can be traced back to Latin sacrificium; sacred + facere to make. To sacrifice is to make sacred. A dictionary meaning of sacrifice is “anything of value given away to secure something of still higher value...” Certainly, a donation for a new sustainable energy system would be a worthy sacrifice. It does not appear that the Green First Team ever used the idea of sacrifice overtly. There is a possibility that the inappropriate use of the concept may even be counterproductive.

<sup>24</sup> M. Scott Peck’s definition of love “...extending one’s self for the purpose of nurturing ...another’s spiritual growth.”

<sup>25</sup> However, the day after the presentation, the Building Committee sent out an email indicating their preferred approach was “Solar Only, but Geothermal Ready” – meaning the geothermal ground loop would be installed, but the church would still operate using natural gas furnaces. When a furnace needed to be replaced, the church would buy a heat pump and hook it up to the existing ground loop heat exchanger. Despite the preference of the Building Committee, the Board representative encouraged the Green First Team to continue proposing a complete

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energy system to the Board.

<sup>26</sup> In retrospect, they may have benefited by viewing the situation as a conflict between the Green First Team (advocates for a Green facility) and the Board (elected to provide governance of the congregation.) Classical conflict management practices remind us that a conflict can be framed as People involved in a common Problem. Ideally, management of the conflict then becomes one of building working relationships between the People so they can work together to solve the Problem.

<sup>27</sup> In the First Universalist case, a Board member agreed to serve as a liaison between the Board and the Green First Team. The Green Team was fortunate, because this Board member was a sceptic and thought a geothermal heating & cooling system was too risky for the church to be considered. By addressing their specific concerns directly, including a site visit to see a geothermal system in operation, and using their advice that the funding model must not increase the church operating budget, the Green Team was better able to craft a proposal to the Board that addressed many of the Board's major concerns.

<sup>28</sup> Without talking down to anyone, explain that the term "cost" will be used in several different contexts. There is an 'Initial Cost' of the new system; there is an ongoing 'Operating Cost' of the existing and the new energy system, and there is the 'Life Cycle Cost' that is the sum of the initial cost and ongoing operating costs. As Board members and stewards of the congregation's finances, they are making a decision about capital equipment (that has a useful life of at least 20-25 years) and that decision generally requires a Life Cycle Cost analysis. That is what the Green Team can provide.

This is a creation-care story about a bottom up (grass roots) initiative started by a small group of concerned church members who were committed to preserving a habitable planet for future generations. They were committed to the 2015 Paris Agreement to limit global warming to less than 2°C.

This story begins as a renovation project at First Universalist Church Denver. The initial project goals were:

- Fix a leaky roof,
- Accommodate more people in a larger Sanctuary,
- Provide more classroom space,
- Replace aging equipment, and
- Use less energy - install new windows, add insulation, new lighting.

But something else occurred and the renovation project grew.

A small group of people within the congregation, sensing an impending anthropogenic global crisis in the near future, introduced a new concern and an additional goal. That concern was the climate crisis and the new goal was to stop doing harm by transitioning to a sustainable renewable energy system for operating the church. A sustainable energy system required new 21st century equipment. The new energy equipment required even more financial resources. The prevailing attitude at the mere mention of this idea was, “We cannot afford it.”

When the capital campaign to raise money for the renovation project ended with a significant shortfall, the new energy system was deleted from the renovation budget.

The Green First Team took on the challenge to find financing for the new sustainable energy equipment. They raised the necessary capital using a combination of donations and low interest member loans. The financing plan for the new system was designed to be “revenue neutral” and not require an increase in the church operating budget. In fact, the new green energy system is expected to cost less than the fossil fuel based system over a 20-year time frame as illustrated in the graphic.

Their story is real. The church is real. The people are real but not identified in the story to protect their privacy. This “GreenNotes” Version of the Case Study is a post-project summary of the key steps taken along the path to zero GHG emissions.

For additional details, see the full Case Study documentation.

