Climate Change: Challenges and Opportunities
Andres Filella, Climate Change Consultant
Sustainable Development and Industry Relations
afilella@metis.org
780-455-2200 ext. 220
## Climate Change Workshop Program

### Program

<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
<th>Presenter(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>4:00 PM</td>
<td><strong>Registration</strong></td>
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<tr>
<td>4:30 PM</td>
<td><strong>Welcome</strong></td>
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<tr>
<td>4:40 PM</td>
<td><strong>Presentation: Climate Change—Challenges and Opportunities</strong></td>
<td>Andres Filella: Climate Change Consultant</td>
</tr>
<tr>
<td></td>
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<td>Métis Nation of Alberta</td>
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<tr>
<td></td>
<td><strong>Presentation: The Alberta Climate Leadership Plan and Available Programs</strong></td>
<td>Jade McLean: Climate Change Liaison</td>
</tr>
<tr>
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<td></td>
<td>Métis Nation of Alberta</td>
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<tr>
<td>5:20 PM</td>
<td><strong>Dinner Break</strong></td>
<td></td>
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<tr>
<td>6:10 PM</td>
<td></td>
<td>Eli Freeman: Nu Energy</td>
</tr>
<tr>
<td>6:20 PM</td>
<td><strong>Presentation: Energy Efficiency and Self-Sufficiency in the Home</strong></td>
<td>Godo Stoyke: CarbonBusters</td>
</tr>
<tr>
<td>7:00 PM</td>
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<tr>
<td>7:10 PM</td>
<td><strong>Breakout Discussions:</strong></td>
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<tr>
<td></td>
<td>Climate Change and Métis Life and Culture</td>
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<tr>
<td></td>
<td>Climate Change Related Initiatives and Programs</td>
<td></td>
</tr>
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<td></td>
<td>Jobs and Economic Opportunities</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Renewable Energy and Energy Efficiency</td>
<td></td>
</tr>
<tr>
<td>8:30 PM</td>
<td><strong>Thank you and Closing Remarks</strong></td>
<td></td>
</tr>
</tbody>
</table>
MNA Climate Change Workshops

Athabasca
Calgary
Cold Lake
Edmonton
Edson
Fort McMurray
Grande Prairie
High Prairie
Lac la Biche
Lethbridge
Lloydminster
Medicine Hat
Peace River
Saint Paul
Slave Lake
Stony Plain
Valleyview
Wabasca-Desmarais
Climate Change
Climate change policy

- Plans at different levels
  - Federal
  - Provincial
  - Municipal
- Challenges
- Opportunities—Need to take action now

- The MNA Climate Change Action Plan
  - Indigenous Climate Change Leadership Initiative component of the Alberta Climate Leadership Plan
What is climate change?
What are the effects?

Source and credit: National Geographic’s 101 Series: Climate Change 101,

Link to video: https://www.youtube.com/watch?v=EtW2rrLHs08.
Climate Change

- Greenhouse gases
  - Carbon dioxide (and other gases)
- Burning fuels
  - Diesel
  - Gasoline
  - Coal
  - Propane
  - Natural Gas
- Sources
  - Electricity production
  - Transportation
  - Industry
  - Agriculture
  - Commercial and Residential
Greenhouse effect

Source: Reducing your Carbon Footprint: http://reducingyourcarbonfootprint.weebly.com/
CO$_2$ concentrations

Source: NASA Global Climate Change: [https://climate.nasa.gov/vital-signs/carbon-dioxide/](https://climate.nasa.gov/vital-signs/carbon-dioxide/)
Canada’s Share

Each Country’s Share of 2011 Total Carbon Dioxide Emissions from the Consumption of Energy

Source: Union for Concerned Scientists
http://www.ucsusa.org/global_warming/science_and_impacts/science/each-countrys-share-of-co2.html#W05UGfnyuM8
Canada’s Share

Top 10 Emitters

Canadians’ share

Per Capita Emissions for Top 10 Emitters

https://wri.org/blog/2014/11/6-graphs-explain-world%E2%80%99s-top-10-emitters

Alberta’s Share

Why should we care in Alberta?

- The earth warms and impacts weather
  - Extreme weather
  - Heat and dryness
  - Rain and flooding
  - Cannot predict weather
Effects on Métis Life

- Effects on traditional way of life
  - Hunting and trapping
  - Fishing
  - Gathering and harvesting
Opportunities

• Alignment with traditional values
  • Care for environment
  • Conservation
  • Food and energy self-sufficiency
  • Planning for future generations

• Jobs

• New industries

Piitapan Solar Project
Indigenous Renewable Energy Projects

Source: Indigenous Clean Energy Network
The world is moving...

• **CHINA’S ACTION ON CLIMATE CHANGE** - 13th Five-Year Plan (2016)
  - PM 2.5 to 25% below 2015 levels
  - For the first time in history, China is implementing a coal consumption cap (4.2 billion tons for 2020)

• **INDIA’S ACTION ON CLIMATE CHANGE**
  - In 2015 India pledged to reduce carbon emissions 33-35% by 2030
  - Committed to 40% of electricity from renewable energy by 2030
The world is moving...

Figure 13. Global new investment in renewable energy by region, 2015, $BN

New investment volume adjusts for re-invested equity. Total values include estimates for undisclosed deals.

Source: UNEP, Bloomberg New Energy Finance
The world is moving…

• Federal: Pan-Canadian Framework on Clean Growth and Climate Change
  • $10/tonne CO2e in 2018
  • $10/tonne increase per year until $50/tonne
  • Investment in public transit
  • Energy labelling for buildings in 2019
  • Green technologies
• Alberta: Climate Leadership Plan
Thank you

- Andres Filella, Climate Change Consultant
  Sustainable Development and Industry Relations
- afilella@metis.org
- 780-455-2200 ext. 220
The Alberta Climate Leadership Plan

Jade McLean, Climate Change Liaison
Sustainable Development and Industry Relations
The Metis Nation of Alberta
jmclean@metis.org
Objective: to reduce carbon emissions while protecting the environment and promoting economic growth

Bend the curve
Reduce GHG’s

Environmental Leadership
Progressive, responsible

Reinvestment
Green infrastructure

Adjustment
Transition support
My Goal:

1. To introduce you to, and explore the different aspects of, the Alberta Climate Leadership Plan and determine what it means for you

2. Introduce you to available programs and funding designed to save you energy and money
The Alberta Climate Leadership Plan

Five key aspects:

1. Carbon Levy and Rebates
2. Ending coal-generated electricity by 2030
3. Developing renewable energy
4. Reducing methane emissions
5. Capping oil sands emissions
Carbon Levy

A province-wide price on carbon

The most **effective** means to reducing greenhouse gas emissions

**Incentivizes** behavioural change (purchasing decisions) and technology change (energy efficiency)
Carbon Tax vs. Carbon Levy

REVENUE SPENDING

Tax

- Elderly support
- Public safety
- Schools
- Hospitals

- Roads
- Canada Revenue Agency
- National defence

- Child benefits
- Public debt
- Employment insurance
- Crown corporations

Levy

- Initiatives for reducing GHG’s
- Rebates and other adjustments related to the carbon levy
Question: how do I know that this money isn’t just going into general government spending?

As specified in the *Climate Leadership Act, Section 3*:

(2) The revenue from the carbon levy may only be used

(a) for *initiatives* related to reducing emissions of greenhouse gases or supporting Alberta’s ability to adapt to climate change, or

(b) to provide *rebates or adjustments* related to the carbon levy to consumers, businesses and communities, including adjustments in the form of tax credits or tax rate reductions
Carbon Levy

January 1, 2017: carbon levy comes into effect at $20/tonne

January 1, 2018: carbon levy will increase to $30/tonne

Federal government will impose $50/tonne by 2022

What’s included?

The levy is placed on heating and transportation fuels

<table>
<thead>
<tr>
<th></th>
<th>2017</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gasoline</td>
<td>+4.49 ¢/L</td>
</tr>
<tr>
<td>Natural Gas</td>
<td>+ 1.011 $/GJ</td>
</tr>
<tr>
<td>Diesel</td>
<td>+5.35 ¢/L</td>
</tr>
<tr>
<td>Propane</td>
<td>+3.08 ¢/L</td>
</tr>
</tbody>
</table>
Carbon Levy: Exemptions

- Electricity
- Renewable fuels (biodiesel, ethanol, etc.)
- Marked gasoline and diesel used by farmers
- Eligible First Nations individuals and bands that purchase fuel on-reserve or band use
- Fuel that is exported
- Fuel used as feedstock in industrial processes rather than combusted
- Fuel consumed by on-site conventional oil and gas producers, under December 21, 2022
- Fuels used by entities subject to the Specified Gas Emitters Reg.
- Fuels used on inter-jurisdictional flights
Carbon Levy: How will it affect me?

Every household will experience different impacts based upon their household’s energy use and driving patterns.

Google:

**Calculate your carbon levy rebate and costs**

Find out the estimated cost of the carbon levy for your household and the rebate you will receive.

A carbon levy is charged on all fuels that emit greenhouse gases, including natural gas, gasoline, diesel and propane. Certain fuels, such as marked gas and diesel used on farms, are exempt from the levy.

Enter your fuel use, food and beverage costs, income and family information to calculate your carbon levy costs and rebate amounts.

Find out more about Alberta carbon levy and rebates.

Adjusted Family Net Income below refers to the net income reported on Line 236 of the tax return for both the eligible individual and his or her spouse or common-law partner, with minor adjustments for Registered Disability Savings Plan and Universal Canada Child Benefit amounts received or repaid. These amounts do not include any income reported by minor children.

All fields are required unless otherwise indicated.

<table>
<thead>
<tr>
<th>Rebate Information</th>
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</thead>
<tbody>
<tr>
<td>2015 Adjusted Family Net Income (Line 236 on your tax return)</td>
</tr>
<tr>
<td>95000.00</td>
</tr>
<tr>
<td>2016 Adjusted Family Net Income (Line 236 on your tax return)</td>
</tr>
<tr>
<td>95000.00</td>
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</table>

<table>
<thead>
<tr>
<th>Marital Status (Single or Married/Common-Law)</th>
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</thead>
<tbody>
<tr>
<td>Married/Common-Law</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Number of Minor Children</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Carbon levy costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monthly natural gas consumption (GJ)</td>
</tr>
<tr>
<td>10</td>
</tr>
<tr>
<td>Monthly gasoline consumption (L)</td>
</tr>
<tr>
<td>250</td>
</tr>
<tr>
<td>Monthly diesel consumption (L)</td>
</tr>
<tr>
<td>0</td>
</tr>
<tr>
<td>Monthly propane consumption (L)</td>
</tr>
<tr>
<td>0</td>
</tr>
<tr>
<td>Monthly amount spent on food and beverages</td>
</tr>
<tr>
<td>767.69</td>
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</tbody>
</table>

Calculate
Carbon Rebates

The carbon rebate is designed to offset the additional costs of carbon to lower- and middle-income Albertans.

<table>
<thead>
<tr>
<th></th>
<th>2017</th>
<th>2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adult</td>
<td>$200</td>
<td>$300</td>
</tr>
<tr>
<td>Spouse (or equivalent)</td>
<td>$100</td>
<td>$150</td>
</tr>
<tr>
<td>Per child (max. 4)</td>
<td>$30</td>
<td>$45</td>
</tr>
</tbody>
</table>

**ELIGIBILITY:**

Single Albertans earning **less than $47,500**
Couples, single parents, and families earning **less than $95,000**

*Additional households will receive a partial rebate*
Carbon Rebates

Let’s use an example:

Sally lives with her husband, Bob, and their two children.

Prior to the carbon levy, their household paid $276/year for natural gas and $4,037/year for gasoline.

The carbon levy will increase their natural gas costs by an additional $136/year and their gasoline costs by an additional $202/year.

Their household will be paying an additional $338/year for their natural gas and gasoline.

These incremental costs are offset by a full rebate of $360/year for their family in 2017.

<table>
<thead>
<tr>
<th>Fuel</th>
<th>Price Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gasoline</td>
<td>+4.49 ¢/L</td>
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</tbody>
</table>
Carbon Rebates

The rebate is tied to *income* and the *number of people* in a household, not energy use.

How do I apply?

You don’t need to apply, however:

Households will *automatically* receive a rebate only if:

1. You’re an Albertan resident
2. You have filed your tax return
3. You meet the income criteria
When and how will I receive my payments?

Payments will be made by the Canada Revenue Agency upon filing of your tax return through direct deposit or by mail.

The timing of your payments will depend on the amount you’re eligible to receive:

- **$400 or more:** delivered in four payments (Jan, Apr, Jul, Oct)
- **$200 - $399:** delivered in two payments (Jan, Jul)
- **$100 - $199:** delivered in one payment (Jan 2017, July in subsequent years)
Carbon Levy: Where’s the money going?
Reinvestment of $5.4 billion over the next 3 years

- Carbon rebates: $1.5 B
- Indigenous communities: $151 M
- Green infrastructure: $1.3 B
- Energy Efficiency Alberta: $566 M
- Small business tax cut: $565 M
- Green investments: $998 M
- Coal communities: $291 M
- Coal communities: $291 M
The Alberta Climate Leadership Plan

Five key aspects:

1. **Carbon Levy and Rebates**

1. **Ending coal-generated electricity by 2030**

1. **Developing renewable energy**
   30% renewable energy by 2030

2. **Reducing methane emissions**
   45% by 2025

1. **Capping oil sands emissions**
   100 MT/year, $30/tonne
How can I benefit?

Available Programs:

**HOUSEHOLDS**

1. Residential No-Cost Energy Savings Program
2. Home Improvements, Instant Savings, and Online Rebates
3. Residential and Commercial Solar Program

**BUSINESS AND NON-PROFIT**

4. Non-Profit Energy Efficiency Transition Program
5. Business, Non-Profit, and Institutional Rebate Program
6. Community Environment Action Grant

**FARMING AND AGRICULTURE**

9. On-Farm Solar PV - On-Farm Energy Management Sub Program
10. Irrigation Efficiency Programs
11. Accelerating Agricultural Innovation Program
12. Agri-Processing Automation and Efficiency Program

**COMMUNITY AND MUNICIPALITIES**

15. Municipal Sustainability Program

**OTHER**

7. Bioenergy Producer Program
8. Renewable Electricity Program
ENERGY EFFICIENCY ALBERTA:
Residential No-Cost Energy Savings Program

Offer **direct, no-charge installation** of energy efficient products

**ELIGIBILITY**
- Available to all Albertans
- Rural or urban areas
- Homes, apartments, condos
- Owner or renter

Eligible products:
- Existing incandescent **lightbulbs**, night lights, and exit signs
- Inefficient **shower heads**
- **Faucets** without aerators
- Traditional **power bars** (or lack of)
- Non-programmable **thermostats**
ENERGY EFFICIENCY ALBERTA:
Residential No-Cost Energy Savings Program

DEADLINE
Registration is ongoing. Installations beginning April 2017.

FUNDING
Free of cost

HOW TO APPLY
Fill out the form at www.efficiencyalberta.ca/residential-no-charge/

You will receive a phone call to schedule your installation.
ENERGY EFFICIENCY ALBERTA

1. INSTANT SAVINGS

EXPIRED: June 11

To help Albertans save on energy-efficient products at participating retailers right at the till

WHAT’S INCLUDED?

- ENERGY STAR® LED Lighting A-Line (Standard Bulb) – $5 savings
- ENERGY STAR® LED non-A line (Specialty Bulbs) - $8 savings
- ENERGY STAR® LED Fixtures & Recessed Downlight Fixtures - $15 savings
- Programmable thermostats - $30 savings
- Dimmers (Hardwired) - $7 savings
- Motion sensors, hardwired indoor or outdoor - $5 savings
- Smart Power Bars - $18 savings
- Heavy Duty Times - $10 savings
- Clotheslines - $12 savings
- Low Flow Bathroom Faucet Aerators - $2 savings
- Low Flow Kitchen Faucet Aerators - $2 savings
- Low Flow Showerhead - $12 savings
2. ONLINE REBATES

**ONGOING**

Purchase any of the eligible products and upload your receipt to Energy Efficiency Alberta and receive a rebate!

**WHAT’S INCLUDED?**

- Refrigerators
- Clothes Washers
- Smart Thermostats

**SAVE UP TO $100**

Refrigerators

**SAVE $100**

Clothes Washers

**SAVE $100**

Smart Thermostats
Performance based rebates- the more energy your home-improvement project saves, the more money you’ll get back in rebates.

HOW DOES IT WORK?
Access the contractor database to find participating installers in your area.

WHAT’S INCLUDED?
- **Insulation** (save up to $3,500)
- **Windows** (save up to $1,500)
- **Tankless Hot Water Heaters** (save up to $1,000)
ENERGY EFFICIENCY ALBERTA:
Residential and Commercial Solar Program

ONGOING

Offer rebates to homeowners, businesses, and non-profits that install solar PV systems.

- Cut solar installation costs by 
  
  up to 30% for residences

- Cut solar installation costs by 
  
  up to 25% for businesses and non-profits

- $0.75/W maximum, up to 
  
  $10,000 (residential) or 
  
  $500,000 (commercial and non-profit)

HOW TO APPLY
The program will be launching summer 2017. Details to come.
ENERGY EFFICIENCY ALBERTA: Business, Non-profit, and Institutional Energy Savings Program

OFFERING

Offering rebates to encourage organizations to choose high-efficiency products.

WHAT'S INCLUDED?
Lighting – Interior
Lighting – Exterior
Lighting – Interior Control
Lighting – Exterior Control
Lighting – Fluorescent Measures
Heating, Ventilation and Air Conditioning (HVAC)
Variable Frequency Drives (VFDs)
Water Heating
www.efficiencyalberta.ca
Indigenous community-owned buildings

Alberta Indigenous Solar Program (AISP)

Alberta Indigenous Community Energy Program (AICEP)
Farming

On-Farm Solar PV Program

Irrigation Efficiency Program
Thank you

Jade McLean, Climate Change Liaison
Metis Nation of Alberta
780-455-2200 ext. 244
jmclean@metis.org
Eli Freeman

• Past
  ➢ Grew up in BC on Vancouver Island
  ➢ Come from an energy / socially conscious family
  ➢ Worked in trades
  ➢ Worked in the oil patch

• Present
  ➢ Recently graduated from the Alternative Energy Technology Program at NAIT
  ➢ Working with HubScale promoting sustainable living and alternative energy technologies

• Future
  ➢ Looking to promote positive change in communities
Justice Dunn

- Graduated from NAIT’s Alternative Energy Technology program in 2017
- Currently working as a consultant with Hubscale
- Energy nerd
- Hopes to combat climate change by helping in the energy transition
Overview

What Will be Covered

• Alberta’s electricity market and Micro-Generation
• Renewable energy technologies
  ➢ Wind
  ➢ Bioenergy
  ➢ Geo-exchange
  ➢ Solar Photovoltaics
    • Solar 101
    • Solar on your roof
• Industry training
The Alberta “Grid”

Source: moorheadelectric.com
Intro to renewables
Sources: inbalance-energy.co.uk, moorheadelectric.com
Wind in Alberta

Sources: flickr.com, bluearthrenewables.com, s-media-cache-ak0.pinimg.com
How does a wind turbine work?

1. Wind
2. Rotation
3. Generator

Source: mechanicalengineeringblog.com
Wind Economics

Source: windenergy.org
Wind Misconceptions

% OF ANNUAL BIRD FATALITIES BY SOURCE

<table>
<thead>
<tr>
<th>Source</th>
<th>% of Annual Bird Fatalities</th>
</tr>
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<tbody>
<tr>
<td>Wind turbines</td>
<td>0.1 - 0.2%</td>
</tr>
<tr>
<td>Communication towers</td>
<td>2.5%</td>
</tr>
<tr>
<td>Pesticides</td>
<td>7%</td>
</tr>
<tr>
<td>Vehicles</td>
<td>7%</td>
</tr>
<tr>
<td>High tension lines</td>
<td>8%</td>
</tr>
<tr>
<td>Cats</td>
<td>10%</td>
</tr>
<tr>
<td>Buildings &amp; windows</td>
<td>55%</td>
</tr>
<tr>
<td>Other</td>
<td>10%</td>
</tr>
</tbody>
</table>

Sources: alternativeenergydiscounthouse.com, gereports.com
Wind Pros vs Cons

Pros

Cons

Guess which one produces more noise...

Sources: wallshots.ca, madaketwind.org
Bioenergy Resource

Sources: bamboo-jsc.com, strategiesonline.net, maxpixel.freegreatpicture.com, desmog.ca
Sources: walltherm.ca
Biomass for Electricity

Sources: forestnet.com
How biogas works

Sources: takamotobiogas.com
Bioenergy Misconceptions

Sources: wheildons.co.uk
Biomass Pros vs cons

Pros

Cons

Sources: byjus.com, livescience.com
Geo-Exchange Technology

Sources: rmfaught.com
Geo-Exchange Economics

Sources: joebradshaw.ca
Geo-Exchange Misconceptions

Sources: gzhaixier.com, energy.gov
Geo-Exchange Pros vs Cons

Pros

Cons

Sources: sterlingheating.com, terratek.ca
The Swanson effect
Price of crystalline silicon photovoltaic cells, $ per watt

Source: Bloomberg New Energy Finance
*Forecast
Global Solar Capacity

1 GW = 3.3 million panels

Source: REN21
Solar Energy

Annual global energy consumption by humans:
- Oil
- Gas
- Coal
- Uranium

Annual solar energy:
- Photosynthesis
- Wind
- Hydro

Source: IEA
To Grid

Source: noviusled.com
Off-grid system

Source: http://energyinformative.org/
Solar PV 101

Sources: solaralberta.ca
Case 2

System size: 6 kW
Load offset: 100%
Capital: $13,800
Potential rebate: $4,140
Payback: 21.3 years
Payback with rebate: 15 years

Case 1

System size: 3 kW
Load offset: 50%
Capital: $8,100
Potential rebate: $2,430
Payback: 25 years
Payback with rebate: 17.5 years

Average Alberta Home

Annual Consumption = 7,200 kWh

HubScale
www.hubscale.ca

NuEnergy
Solar Misconceptions

http://solarhelp.info/


https://www.bidspotter.co.uk/en-us/auction-catalogues/es-group/catalogue-id-ed10504/lot-a94079b1-53e4-4217-81ae-a695014273e1

Solar on your home

Where to start?

Source: Getty images

Choose a Contractor

Source: SESA

Site Assessment

Source: Home Power Magazine
Proposal

OPTION 1: SOLAREDGE SOLAR PHOTOVOLTAIC (PV) SYSTEM

6.36 kW DC (6.0 kW AC) SOLAR CAPACITY

System Capacity: 6.36 kW DC @ STC
Application: Power Generation (On-Site) with Export Capability
System Type: DC Optimizer / Central Inverter; Grid Inter-Connected
System Mounting: Sloped Roof Mounting 26.5°Slope, 180° Azimuth

Annual Electricity Production in Year 1: ~6,810 kWh/Year Under Ideal Conditions
System Includes:
- Supply, Installation and Start-up
- Interconnection to Existing Electrical Panel
- Grid Interconnection Assistance
- 1-Year Warranty
System Does Not Include:
- Roofing Modifications

Pros:
- Improved Safety (Optimizers 1VDC Safety Voltage)
- Reliable
- Proven Technology
- Energy Production Stability
- Environmentally Beneficial
- Visually Impactful
- Long System Lifecycle
- Module Level Max PowerPoint Tracking
- Module Level Monitoring

Project Cost:
- $16,660 Before Rebate
- $11,890 After Rebate
Internal Rate of Return: 5.13%
Payback (Years): 17
Net Present Value (NPV): $1,823
Lifecycle Energy Production Cost: $0.06/kWh
Solar on your home

Confirm Designs

Permit and Micro-gen Application

Installation and Commission

Generate Electricity!

Source: Goodwill Construction Services

Source: Garcia/Kraemer

Source: Thinkstock

Source: Mays Building Services
Industry Training

- Transitioning
  - Trades
  - Oil and gas (Iron and Earth)/AGEN
- Green building design certifications
- Job opportunities
  - Networking events
  - LinkedIn

- Current programs and opportunities
  - NAIT- Alternative Energy Technology
  - SESA- PV for electricians
  - Lethbridge College- Wind Turbine Technician
  - Grid works
  - Lakeland College- Renewable Energy and Conservation

Source: CBC News
Source: www.benzinga.com
Thank You!
Metis Nation Climate Leadership Workshop

Energy efficiency and self-sufficiency
Presenter: Godo Stoyke. B.Sc., M.Sc.
Self-sufficiency

Housing
Food
Water
Energy
Transportation
Food

HubScale
www.hubscale.ca
Carbon Savings
82 Millions Kg $CO_{2e}$
$27.1$ mio

CarbonBusters.org
CReturns.com
Canada’s most abundant green energy?

1. Negawatts
2. Negawatts
3. Negawatts
Global GHG abatement cost curve beyond business-as-usual – 2030

Source: McKinsey 2009
1 tonne of CO2 gas

3,903 bath tubs

1 m3 CO2 = 1.83 kg, 1 bath tub = 140 L
Alberta family carbon pie: 19.6 t CO2e

Car 6.1 t

Nat. Gas 7.7 t

Power 5.7 t

Water 0.2 t

Detached home, 2 cars, Scope 1 & 2
Alberta family: energy costs/a

Total $6,545

Add fixed costs > $4,980

- Car $3927
- Heating $1,027
- Power $862
- Water $729

Based on 200L water/person/day, 3 person household, 150GJ NG, 8000 kWh electr., $3.33/m3 H2O, $6.84/GJ, $0.1078/kWh, 11L/100 km cars (two), 15,000 km/a, $1.19/L gasoline
Assumed energy prices

Electricity: **10.78 ¢/kWh**

Natural gas: **$6.84/GJ** (incl. $1.517/GJ carbon levy)

Water: **$3.33/m³**

Gasoline **$1.19/L** (incl. 6.73¢/L carbon levy)
• Cost: $27,000 ($3,900 incremental) • Savings/year: $1160
• Payback 3.3 years • CO2e: 38.0t (life)

Based on incremental cost of $3,900 and average Canadian fuel efficiency, 4.5l/ave.
Cost: $32,000 ($9,000 incremental)

Saved: $1,721/year

Payback: 5.2 years

CO2e: 64.4 (life)
Best: Electric Nissan Leaf 20 kWh/100 km

Best gas: Toyota Prius • 4.5L/100 km •

Cheapest: Mitsubishi Mirage • 6.0L/100 km • $9,998

Sedan: Toyota Yaris • 6.6L/100 km • $17,315

Sedan: Honda Fit LX: • 6.5L/100 km • $19,586

Pickup, small: • Chevrolet Colorado diesel • 9.5L/100 km

Pickup, standard: • Ford F-150 • 10.9:/100 km • $28,249

SUV small: • Toyota RAV4 hybrid • 7.3 L/100 km

SUV, standard: • Lexus NX300h • 7.5 L/100 km

Excludes delivery and taxes
Ford F-150 base model • 10.9L/100 km • $28,249 vs. GMC Sierra FFV 4.3L 17.1L/100 km • $30,745

Cost: $-2,496, Savings: $1,107/year Payback: zero years CO2e: 36.3t (life)
How to save energy

- Properly inflated tire: 3% Cost: $0, Savings: $58/year, payback: 0 years, CO2e: 0.5t (5 years)
- Accelerate and break smoothly
- don’t speed —> 10%

Cost: $0, Savings: $195/year, payback: 0 years, CO2e: 2t (5 years)

Based on 7psi under inflation, 0.4% per psi http://procarmechanics.com/how-tire-pressure-affects-mpg/ b, https://bucks.blogs.nytimes.com/2011/04/25/a-tire-engineers-tips-for-better-gas-mileage/?_r=0
Annual Fueling Costs  V2G

Source: Jon Wellinghoff, FERC, Jan. 2007

$1200  $720  $495

$135  $360

Spinning  Regulation

-$425  -$2790

10,705 mpg

1.03L

$13.66
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Watt is a kiloWatt-hour?

- Stove: 100 Watt, 1 hour
- 100 Watt: 100 Watt
- 10 Watt: 10 hours
5-10x more efficient

Cost: $0
Savings: $71/year
Payback: 0 years
CO2e: 5.2 t/life
Free from: efficiencyalberta.ca
Colour “temperature” ≤3000K
Power Vampires

- 2 x Genessee (TV)
- Cost $0
- $86 saved/a
- Payback: 0 yrs
- 10.2t CO2e (life)
EcoFitt: Free
Principle of energy service

Energy Supply: 64 Watts

Heat Retention: 0 Watts
Front-loading washer

- Cost: $233 (incremental)
- Saved: $234/year
- Payback: 0.99 years
- CO2e (life): 23.3t
Condensing and heat pump dryer

- Condensing:
- Cost $139
- $20 saved/a
- Payback: 6.99 yrs
- 3.0t CO2e (life)

- Clothes line
- Drying rack
Fridge

- Cost: $664/$9 (incremental)
- Saved: $59/year
- Payback: 0.15 years
- CO2e (life): 7t

- Avoid basement trap

Compared to 2000 fridge, 17.5 cu ft. 850 kWh, replace 300 kWh
“Watts up?” meter
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Cost: $150
Savings: $31/year
Payback: 4.9 years
CO2e: 4.5 t/life

Dog bonus: 300 kg
Pilot lights: Fireplace & Furnace May-September

Cost: free
Savings: $43/year
Payback: 0 years
CO2e: 6.3 t/life

6.33 GJ/year, 20 years
High-efficiency, condensing furnace

92-98% efficient

DC motor

Modulating fan and burner

Cost: $6,500/$1500 incremental

Savings: $180/year

Payback: 8.3 years

CO2e: 31.4 t/life
Insulate hot water tank and pipes

Cost: $60
Savings: $11/year
Payback: 5.6 years
CO2e: 1.2 t/life

Cost: $3
Savings: $9
Payback: 0.3 years
CO2e: 1.3 t/life
**Smart thermostat**  
Cost: free  
Night setback saves $170/year

**Low-flow shower head**  
Cost: free  
Savings: 30%  
Payback: instant
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Water-saving toilet

3L/flush
compressed air
cost: $425
savings: $83/a
19.6 kg CO2e/a
payback: 5.1 years
Carbon Busters Zero Carbon Sustainable Community