CONVERSATIONS ON SOCIAL ISSUES: CLIMATE CHANGE, GREEN JOBS, AND SOCIAL JUSTICE

Presented by:
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Bachelor’s Program, South Seattle College

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Seattle Central College
THE POOR SHOULDER MORE OF THE BURDEN OF CLIMATE CHANGE

• 3 key takeaways from the Fourth National Climate Assessment. Climate change is*:
  • Expensive
  • Deadly
    • Extreme heat/cold events as well as deadly storms and general flooding/sea level rise
    • Air quality issues
    • Water/Food insecurity
  • Here, and we can still work on countering it
    • Limit to 1.5° C rise in temp. above pre-industrial levels
• And the poor are impacted proportionately more

*According to Vox, 3 big takeaways from the major new US climate report, by Umair Irfan
By 2030: Nationwide – 32% decrease in carbon emissions (below 2005 levels).
WA State goal – 37% decrease in carbon emissions (below 2012 levels).

Already legislation in place for greenhouse gas emission reductions (before clean power plan).

Overall for the state:
- By 2020: Reduce to 1990 levels
- By 2035: 25% reduction (below 1990 levels)
- By 2050: 50% reduction (below 1990 levels)

State agencies are REQUIRED (since 2009):
- By 2020: 20% reduction (below 2005 levels)
- By 2035: 36% reduction (below 2005 levels)
- By 2050: 57.5% reduction (below 2005 levels)

By 2030:
- Energy – 50% reduction (below national average)
- Water – 50% reduction (below 2030 District average)
- Transportation – 50% reduction (below 2030 District average)

City of Seattle goal - 58% reduction by 2030 to keep us on track to our ultimate goal of carbon neutrality by 2050.

• STARS Rating (AASHE) a measure of organizational excellence under the Seattle Colleges’ District Strategic Plan
• Sustainability Goals undergoing revision

The Big Picture
Seattle Colleges Sustainability Goals

**Sustainability Instruction**
- Goal 1: Identify sustainability related and focused courses in course catalogs and listing
- Goal 2: Increase number of sustainability focused courses 20% by 2020 compared to 2013 baseline
- Goal 3: All sustainability projects have a student learning component

**Sustainable Operations**
- Goal 1: Surpass greenhouse gas reduction targets provided by the State Agency Climate Leadership Act
- Goal 2: All new buildings will be constructed to at least a LEED Silver standard
- Goal 3: Compared to 2019, reduce garbage waste 50% by weight by 2030
- Goal 4: Meet Seattle 2030 District resource conservation targets
- Goal 6: Develop a District Purchasing Policy to purchase, when available:
  - GreenSeal or EcoLogo brand products
  - EPEAT Silver or higher certified electronics

**Sustainability Engagement**
- Goal 1: Maintain an active college-level Sustainability Committee on each campus to help enact the District Sustainability Plan
- Goal 2: Include a sustainability component into new student and new staff orientation
- Goal 3: Produce regular sustainability communications to the campus at large

**Sustainability Planning**
- Goal 1: Perform STARS Sustainability Assessment every 3 years with an increased score each submission
- Goal 2: Develop and maintain college-level Sustainability Action Plans
- Goal 3: Integrate sustainability goals into College and District Strategic Plans
ENERGY PERFORMANCE PROJECTS

• Meeting our needs today without compromising the needs of future generations

• Money
  • Energy projects come at high cost
    • Fuels, supply and demand
  • Simple payback and net present value
    • “low-hanging fruit”
    • The value now of future streams of money
FUNDING SOURCES

- State of Washington Capital Budget
  - State Board of Community and Technical Colleges filter/lens
- State of Washington Department of Commerce
  - Grants
    - Solar Grants and non-solar grants
    - Incremental grants
- Utilities e.g. Seattle City Light
  - Grants and incentives
  - Local commitments, Savings
SEATTLE CENTRAL STORY

- Steam and a transition to electricity and natural gas
  - GHG emissions and SCL
  - Managing costs
  - Electricity as fuel source is not adequate
  - Existing infrastructure limitation

- Energy Performance Contracting EPCO/ESCO
  - Alternative Public Works delivery methodologies RCW 39.10
  - Fee intensive, but open book collaborative process, guaranteed
  - Savings measured in kWh
PROJECT TARGETS

- Insulation
  - windows, walls, piping, air sealing
- Equipment controls
  - DDC/BAS, VFDs, analytics, commissioning
- Equipment replacement
  - boilers, air handlers, heat pumps, motors, fans
- Fixtures: lights, toilets, urinals
- Energy production
  - Solar, Kinetic, Cogeneration/Combined heat and power
2010 completion of first Energy project, the low hanging fruit

- **Scope**
  - HVAC controls, HVAC equipment, Boiler, lighting, skylights, insulation
- **Cost**
  - $3,544,042
- **Annual Energy Savings**
  - $198,345

2010 through 2016 ~$3.5m with $75k annual savings

GRITS
2018 ENERGY PROJECT

- **Scope (Facility Improvement measures)**
  - Heat pump
  - Duct Sealing, Envelop Sealing
  - LED lamps
  - Solar Panels: Our first energy production!
  - Several other non-energy saving items

- **Cost is $3.9m Energy Savings $82k**

- **Grants:**
  - Department of commerce
    - Non-solar grant $315k
  - Solar grant $204k
  - Seattle City Light
    - $200k solar grant
    - incentives
# Table 4.3 - Cash Flow Analysis

Since the elevator FIM addition will not be financed, this table has not been updated to reflect the elevator.

### Annual Cash Flow and Cumulative PV

### Cash Flow Analysis

<table>
<thead>
<tr>
<th>Period</th>
<th>Recession</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>W2H Administered Solar Production Incentive</td>
<td>$306,103</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Loan Payments</td>
<td>$45,763</td>
<td>$45,763</td>
<td>$45,763</td>
<td>$45,763</td>
<td>$45,763</td>
<td>$45,763</td>
<td>$45,763</td>
<td>$45,763</td>
<td>$45,763</td>
<td>$45,763</td>
<td>$45,763</td>
</tr>
<tr>
<td>Annual Electrical Utility Savings ($)</td>
<td>2.0%</td>
<td>$7,051</td>
<td>$7,051</td>
<td>$7,051</td>
<td>$7,051</td>
<td>$7,051</td>
<td>$7,051</td>
<td>$7,051</td>
<td>$7,051</td>
<td>$7,051</td>
<td>$7,051</td>
</tr>
<tr>
<td>Subtotal Garage Utility Savings ($)</td>
<td>0.0%</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
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<tr>
<td>Annual HVAC Utility Savings ($)</td>
<td>2.0%</td>
<td>$45,541</td>
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<td>$45,541</td>
<td>$45,541</td>
<td>$45,541</td>
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<td>$45,541</td>
<td>$45,541</td>
<td>$45,541</td>
</tr>
<tr>
<td>Annual Water/Refriger Utility Savings ($)</td>
<td>3.5%</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>Annual Other Utility Savings ($)</td>
<td>3.5%</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>Annual Other Operational Savings ($)</td>
<td>$14,971</td>
<td>$14,971</td>
<td>$14,971</td>
<td>$14,971</td>
<td>$14,971</td>
<td>$14,971</td>
<td>$14,971</td>
<td>$14,971</td>
<td>$14,971</td>
<td>$14,971</td>
<td>$14,971</td>
</tr>
<tr>
<td>Annual Cash Flow ($)</td>
<td>$105,046</td>
<td>$105,046</td>
<td>$105,046</td>
<td>$105,046</td>
<td>$105,046</td>
<td>$105,046</td>
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<td>$105,046</td>
<td>$105,046</td>
<td>$105,046</td>
<td>$105,046</td>
</tr>
<tr>
<td>Cumulative PV ($)</td>
<td>$105,046</td>
<td>$210,092</td>
<td>$315,137</td>
<td>$416,183</td>
<td>$517,228</td>
<td>$618,273</td>
<td>$719,318</td>
<td>$820,363</td>
<td>$921,408</td>
<td>$1,022,453</td>
<td>$1,123,500</td>
</tr>
</tbody>
</table>

### Financial Ratios

- **Equity:** $460,015
- **Net Long-Term Debt:** $306,103
- **Net Loss:** $53,912
- **Yearly Cash Flow:** $3,472
- **Yearly Net Margin:** 10.0%
- **Yearly Revenue:** $14,971
- **Yearly Interest Rate:** 20.0%
### Environmental Impact Calculation

#### Seattle Colleges
Environmental Impact Calculator

<table>
<thead>
<tr>
<th>Non-Baseload</th>
<th>Load Factor to Use</th>
<th>lbf CO₂e/kWh (eGRID Subregion Electricity Emissions Factor)</th>
</tr>
</thead>
<tbody>
<tr>
<td>NWPP</td>
<td>Select eGRID Subregion</td>
<td>1.53381</td>
</tr>
</tbody>
</table>

#### Amount Each Utility Type Will Be Reduced Per Year

<table>
<thead>
<tr>
<th>Electricity</th>
<th>kWh</th>
<th>lbf CO₂</th>
<th>Metric Tonnes CO₂</th>
</tr>
</thead>
<tbody>
<tr>
<td>Natural Gas</td>
<td>0</td>
<td>0 lbf CO₂</td>
<td>0.0 Metric Tonnes CO₂</td>
</tr>
<tr>
<td>Steam</td>
<td>959</td>
<td>187,276 lbf CO₂</td>
<td>84.9 Metric Tonnes CO₂</td>
</tr>
<tr>
<td>Fuel Oil</td>
<td>13</td>
<td>282 lbf CO₂</td>
<td>0.1 Metric Tonnes CO₂</td>
</tr>
<tr>
<td>Propane</td>
<td>0</td>
<td>0 lbf CO₂</td>
<td>0.0 Metric Tonnes CO₂</td>
</tr>
</tbody>
</table>

Total Reduction = 1,240,724 lbf CO₂ = 562.8 Metric Tonnes CO₂

#### This Annual Emissions Reduction Is Equivalent To The Following:

<table>
<thead>
<tr>
<th>Emissions Reduction</th>
<th>Equivalent</th>
</tr>
</thead>
<tbody>
<tr>
<td>108</td>
<td>Number of Vehicles Removed From Roads (Avg Size); or</td>
</tr>
<tr>
<td>2,102,922</td>
<td>Number of Miles Not Driven Per Year (Avg Size); or</td>
</tr>
<tr>
<td>15,509</td>
<td>Number of 75 Watt Light bulbs Not Energized; or</td>
</tr>
<tr>
<td>54</td>
<td>Number of Avg Sized Houses Removed From Power Grid; or</td>
</tr>
<tr>
<td>154</td>
<td>Acres of Trees Planted; or</td>
</tr>
<tr>
<td>579,778</td>
<td>Pounds of Coal Not Burned Per Year</td>
</tr>
</tbody>
</table>

#### Other Emissions Factors
- Natural Gas: 11.707 lbf CO₂ / Therm
- Steam: 195.3636 lbf CO₂ / Mlbs (Seattle Steam)
- Fuel Oil: 22.384 lbf CO₂ / gal
- Propane: 12.5 lbf CO₂ / gal

Conversion: 2,204,623 lbf CO₂ / Metric Tonnes CO₂

#### Equivalents Conversions
- Car Emissions: 11,470 lbf CO₂ / car / yr
- Tree Carbon Sequestration: 8,066 lbf CO₂ / acre / yr
- Vehicle Mileage Emissions: 0.39 lbf CO₂ / mile
- 75 W Light Bulb Emissions: 80 lbf CO₂ / Light Bulb / yr
- Tree Carbon Sequestration: 8,066 lbf CO₂ / acre / yr
- Coal Emissions: 2.14 lbf CO₂ / pound Coal
SOLAR PANELS
FUTURE PROJECTS

• Steam is our biggest cost and pollution risk.
• Electricity based heating and cooling is not adequate/technology does not exist
• Tune Ups

• Combined heat and power/Cogeneration
  • Produce steam and electricity using natural gas
  • Pros and cons e.g. heat dumping, GHG production
  • Solutions exist, absorption chillers, stack burners, expensive and high tech
STUDENT INVOLVEMENT

• Patience with projects and their inconveniences
• Internships
  • GRITS
  • HVAC Equipment preventive maintenance program
MY GREEN JOB

• Passion for smart construction, cold climate, frugality
  • Building enclosures
  • HVAC
  • Glazing
  • Energy Codes
  • Creative financing
  • Purpose
GREEN JOBS

- ANY JOB!
- Natural Sciences
- Social Sciences
- Food Systems/Ag/Farming/Urban Farming
- Planners/Designers
- Building Operators/Engineers/Mgmt/Energy (Demand)
- Energy (Supply)/Energy Trading/Storage
- Transportation
- Government
- Construction
- Manufacturing
- Water/Wastewater Treatment
- Materials Management/Recycling/Waste Reduction
- Marketing/Communications
- Sustainability Coordinators/managers/Directors/CSR
- Non-profits/Community organizations
PATHWAYS INTO GREEN JOBS

• **Seattle Central College**
  - **AA, AS, AB** (Associate of Arts, Associate of Science, Associate of Business)
    - AS Track 1 – Biological Sciences
    - AS Track 2 – Engineering, Computer Science, Physics, & Atmospheric Science
    - Emphasis – Equity & Social Justice, Global Health, Global Studies
  - **Sustainable Agriculture Education (SAgE)**
    - Bioregional Food Systems Emphasis for an AA or AS
  - Career Training Degrees: Culinary, Business Technology Mgmt., Creative Arts & Design, Education & Human Services, Healthcare, IT/Web/Programming, Maritime, Wood Technology
    - Many of these degrees now transfer → BAS Degrees (Bachelor’s of Applied Science)
  - Individual courses: ENVS, ANTH, ECON, HUM, SOC, HEA, BUS, CUL

• **South Seattle College**
  - **Apprenticeship** – 20 trades, earn while learning → Multi-Occupational Trades Associate’s
    - **Sustainable Building Science Technology BAS**
WHAT IS THE SUSTAINABLE BUILDING SCIENCE TECHNOLOGY BAS PROGRAM?

- Accessible and affordable way to make a difference
- 2-year cohort program confers a Bachelor of Applied Science (BAS) degree
- ~15 students per year
- Most students work full-time (4 Saturday classes per quarter)
- Combination of technical and business/management skills
- Graduates are qualified (with experience) to perform Seattle Building Tune-ups
- At least 2 years of related work experience (built environment, sustainability, volunteer, club)
- SBST Open House, Wed. March 20th, 5:30pm at South Seattle College, Georgetown Campus!
ALISON PUGH-
MY GREEN JOB

1994 B.A. in Art History from Mount Holyoke College (South Hadley, MA)
1996 – Mountain People’s Northwest (now UNFI)
2001 – Edmonds Community College
2008 M.B.A. in Sustainable Business from the Bainbridge Graduate Institute (now Presidio Graduate School)
2008 – Energy Management Director/Sustainability Researcher, Edmonds CC
2014 – NSF Grant Director, South Seattle College
2017 – Faculty, Sustainable Building Science Technology BAS
NEVER UNDERESTIMATE THE POWER OF A STUDENT

(Past) Edmonds CC Green Team

Campus Green Fund

stars, a program of aashe

Sustainability Fee
100 SOLUTIONS TO REVERSE GLOBAL WARMING

Search solutions by name or rank

#1 Best-Selling Environmental Book of 2017

ORDER THE BOOK

“...[T]he public is hungry for this kind of practical wisdom.”
— David Roberts, Vox

MORE REVIEWS
# Summary of Solutions by Overall Rank

This table provides the detailed results of the Plausible Scenario, which models the growth solutions on the Drawdown list based on a reasonable, but vigorous rate from 2020-2050. Results depicted represent a comparison to a reference case that assumes 2014 levels of adoption continue in proportion to the growth in global markets.

**NOTE:** Energy Storage (utility-scale & distributed), Grid Flexibility, Microgrids, Net Zero Buildings, and Retrofiting were not modeled independently to avoid double counting impacts from other solutions.

<table>
<thead>
<tr>
<th>Rank</th>
<th>Solution</th>
<th>Sector</th>
<th>TOTAL ATMOSPHERIC CO2-EQ REDUCTION (Gt)</th>
<th>NET COST (BILLIONS US $)</th>
<th>SAVINGS (BILLIONS US $)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Refrigerant Mgmt</td>
<td>Materials</td>
<td>88.74</td>
<td>N/A</td>
<td>$902.77</td>
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<tr>
<td>2</td>
<td>Wind Turbines (Onshore)</td>
<td>Electricity Generation</td>
<td>84.60</td>
<td>$1,225.37</td>
<td>$7,425.00</td>
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<td>3</td>
<td>Reduced Food Waste</td>
<td>Food</td>
<td>70.53</td>
<td>N/A</td>
<td>N/A</td>
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<tr>
<td>4</td>
<td>Plant-Rich Diet</td>
<td>Food</td>
<td>66.11</td>
<td>N/A</td>
<td>N/A</td>
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<tr>
<td>5</td>
<td>Tropical Forests</td>
<td>Land Use</td>
<td>61.23</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>6</td>
<td>Educating Girls</td>
<td>Women and Girls</td>
<td>51.48</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>7</td>
<td>Family Planning</td>
<td>Women and Girls</td>
<td>51.48</td>
<td>N/A</td>
<td>N/A</td>
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<tr>
<td>8</td>
<td>Solar Farms</td>
<td>Electricity Generation</td>
<td>36.90</td>
<td>$80.60</td>
<td>$5,023.84</td>
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<tr>
<td>9</td>
<td>Silvopasture</td>
<td>Food</td>
<td>31.19</td>
<td>$41.59</td>
<td>$699.37</td>
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<tr>
<td>10</td>
<td>Rooftop Solar</td>
<td>Electricity Generation</td>
<td>24.60</td>
<td>$453.14</td>
<td>$3,457.63</td>
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<tr>
<td>11</td>
<td>Regenerative Agr.</td>
<td>Food</td>
<td>23.15</td>
<td>$57.22</td>
<td>$1,528.10</td>
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<td>12</td>
<td>Temperate Forests</td>
<td>Land Use</td>
<td>22.61</td>
<td>N/A</td>
<td>N/A</td>
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<td>13</td>
<td>Peatlands</td>
<td>Land Use</td>
<td>21.57</td>
<td>N/A</td>
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<td>Tropical Staple Trees</td>
<td>Food</td>
<td>20.19</td>
<td>$120.07</td>
<td>$626.97</td>
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<td>15</td>
<td>Afforestation</td>
<td>Land Use</td>
<td>18.06</td>
<td>$29.44</td>
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<td>16</td>
<td>Conservation Agr.</td>
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<td>17.35</td>
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<td>$22.10</td>
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<td>18</td>
<td>Geothermal</td>
<td>Electricity Generation</td>
<td>16.60</td>
<td>$-135.48</td>
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<td>19</td>
<td>Managed Grazing</td>
<td>Food</td>
<td>16.34</td>
<td>$50.48</td>
<td>$735.27</td>
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<td>20</td>
<td>Nuclear</td>
<td>Electricity Generation</td>
<td>16.09</td>
<td>$0.88</td>
<td>$1,713.40</td>
</tr>
</tbody>
</table>
OTHER WAYS TO GET INVOLVED

• **Sustainability Council**
• **Student Clubs**
  • Lots of cultural clubs
  • Women in Science and Engineering
  • Mechanical Engineering Club
  • Woodworkers Advocating for Gender Equity
• **VOTE (local elections matter)**
  • City Community Meetings
  • Policy Input
  • Communicate with legislators (local, state, federal)
• **Community Orgs**
  • Sustainable Seattle (and by neighborhood), Transition Seattle, Got Green, Sustainable Communities All Over Puget Sound (SCALLOPS)
• **Industry Orgs.**
QUESTIONS

Thank you