Realistic, Cost Effective and Useful Artificial Intelligence (AI)

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Sydney Roberts, PhD, Technology Director
APOGEE PRESENTERS

Sydney Roberts, PhD
Technical Director
Spent years leading research on energy end use and performance models for major home appliances. Delivers market-leading solutions based on building science and stakeholder engagement expertise.

Joel Gilbert, P.E.
President, Chief Software Architect
Leads Apogee’s accomplished team of engineers, data scientists, analysts, and researchers. Responsible for applying highest standards of excellence in building science and engineering, applying artificial intelligence and predictive analytics to build strong customer relationships.

“Moving from anecdotes to analytics!”
AGENDA

#1 Monetize Financial Benefits of Analytics

#2 Use Customer Bills for Ongoing Engagement

#3 Use *Interval Data* for Rate Transformation and Mid-Cycle Alerts

#4 Expand Value Propositions
What is Artificial Intelligence (AI)?

“the theory and development of computer systems able to perform tasks that normally require human intelligence, such as visual perception, speech recognition, decision-making, and translation between languages”

We will focus on Decision Making
The Imitation Game

2014 Story of Alan Turing (1940’s)

- Touring created computer that cracked the German encryption: The Enigma Machine
- Puzzle had to be solved every day

Spoiler Alert: key step was “training” data set that occurred on Hitler’s birthday.

Standard for AI is the Turing Test
Ex Machina (2014)

Application of a modern Turing Test

Spoiler Alert:
- Eva learns she is being tested
- She then tests the tester
- Realizes the consequences
- Takes control
AI Analysis **Improves** Targeting
Key Steps to Near Term Successful AI

The "real world" → Measuring devices → Preprocessing: $\tilde{u} = \frac{\tilde{v}}{\|\tilde{v}\|}$ → Dimensionality reduction: $\Delta R/R_0$ → Model Learning → Model Testing → Analysis results
First Pick the Questions then use “Deep Learning”
Key Steps to Near Term Successful AI

First Decide: What do I want to know?

- Relevance to individual customers – what can they do?
- Alert to replace filters and service air conditioners?
- Where are the inefficient air conditioners?
- How big are they? How much will they save?
**Key Steps to Near Term Successful AI**

Start with:
- Energy Bills
- Coincident Weathers
- You don’t need AMI to work wonders!
600,000 Customer Summer *Calculated* Thermostat Settings

- **~15% hold 78 F**
- **~30% hold < 72 F**

The diagram shows the distribution of thermostat settings among customers. The x-axis represents the percent of customers with a specific thermostat temperature or lower, while the y-axis represents the cooling thermostat setpoint. The graph indicates that about 15% of customers maintain their thermostat at 78°F or lower, and approximately 30% maintain it at 72°F or lower.
600,000 Customer Calculated Heating Setpoints

~ 65% hold 68 F
Proactively Contact Customers

• With inefficient AC (possibly on stressed feeders)
• With gas or propane heat – heat pump targets
• Pre-emptively avoid likely high bill complaints
  – Predict their seasonal energy costs
  – Remind them to change filters/service the units
  – Alert them to hot weather events
TODAY’S WEATHER

TAMPA, FLORIDA

90°/71°

ELECTRIC COST: $6.50

THIS WEEK’S FORECASTED ELECTRIC COST*

$40

* Costs are estimates based on your home’s profile and the current forecast.

WEEKLY FORECAST

Thu, Apr 23
91°/78°
Electric Cost: $8.25

Fri, Apr 24
86°/76°
Electric Cost: $8.25

Sat, Apr 25
86°/73°
Electric Cost: $7.25

Sun, Apr 26
84°/66°
Electric Cost: $5.00

Mon, Apr 27
82°/64°
Electric Cost: $2.25

Tue, Apr 28
86°/73°
Electric Cost: $2.50
Realistic, Cost Effective and Useful Artificial Intelligence in the Energy Industry
Add Personalized Elements

Engaged Customers
- Add home profile details
- Indicate engagement agenda
"I think you should be more explicit here in step two."

Then a miracle occurs...
### How Accurate/Serious are Predictions?

<table>
<thead>
<tr>
<th>Think about weather forecasts</th>
<th>How about COVID-19 tests?</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Probability of rain tomorrow</td>
<td>• Test indicates positive – but wrong</td>
</tr>
<tr>
<td>• Probability of rain in each hour today</td>
<td>• Test indicates negative – but wrong</td>
</tr>
</tbody>
</table>
Increase Accuracy using Online Self-Serve Online Audit
Promote Electric Vehicles
Once Engaged Add Monthly Bill Analysis

YOUR MONTHLY ELECTRIC COST BREAKDOWN
<table>
<thead>
<tr>
<th>Bill Date</th>
<th>Avg. Temp</th>
<th>Days</th>
<th>Cooling</th>
<th>Heating</th>
<th>Refrig.</th>
<th>Lights</th>
<th>Cooking</th>
<th>Water Heating</th>
<th>Dishwasher</th>
<th>Clothes Washer</th>
<th>Clothes Dryer</th>
<th>Other Appliance</th>
<th>Actual Bill Total</th>
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</thead>
<tbody>
<tr>
<td>Sep 19, 2019</td>
<td>83.7 F</td>
<td>31</td>
<td>715</td>
<td>0</td>
<td>110</td>
<td>83</td>
<td>110</td>
<td>398</td>
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<td>94</td>
<td>120</td>
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<tr>
<td>Aug 19, 2019</td>
<td>82.6 F</td>
<td>29</td>
<td>619</td>
<td>0</td>
<td>103</td>
<td>77</td>
<td>103</td>
<td>350</td>
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<td>12</td>
<td>88</td>
<td>113</td>
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<tr>
<td>Jul 19, 2019</td>
<td>82.9 F</td>
<td>32</td>
<td>699</td>
<td>0</td>
<td>114</td>
<td>85</td>
<td>114</td>
<td>410</td>
<td>14</td>
<td>14</td>
<td>97</td>
<td>124</td>
<td>1,854</td>
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<tr>
<td>Jun 19, 2019</td>
<td>82.6 F</td>
<td>30</td>
<td>639</td>
<td>0</td>
<td>107</td>
<td>80</td>
<td>107</td>
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<td>91</td>
<td>117</td>
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<tr>
<td>May 20, 2019</td>
<td>76.7 F</td>
<td>32</td>
<td>372</td>
<td>0</td>
<td>114</td>
<td>85</td>
<td>114</td>
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<td>Apr 18, 2019</td>
<td>70.7 F</td>
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<td>125</td>
<td>12</td>
<td>103</td>
<td>77</td>
<td>103</td>
<td>351</td>
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<td>113</td>
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<td>70.0 F</td>
<td>29</td>
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<td>27</td>
<td>103</td>
<td>77</td>
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<tr>
<td>Feb 19, 2019</td>
<td>62.1 F</td>
<td>29</td>
<td>17</td>
<td>121</td>
<td>103</td>
<td>77</td>
<td>103</td>
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<td>12</td>
<td>88</td>
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<tr>
<td>Jan 21, 2019</td>
<td>64.8 F</td>
<td>34</td>
<td>49</td>
<td>90</td>
<td>121</td>
<td>91</td>
<td>121</td>
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<td>15</td>
<td>103</td>
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<td>Dec 18, 2018</td>
<td>63.0 F</td>
<td>30</td>
<td>69</td>
<td>138</td>
<td>107</td>
<td>80</td>
<td>107</td>
<td>421</td>
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<td>91</td>
<td>117</td>
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<td>Nov 16, 2018</td>
<td>76.4 F</td>
<td>28</td>
<td>320</td>
<td>1</td>
<td>100</td>
<td>75</td>
<td>100</td>
<td>333</td>
<td>12</td>
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<td>85</td>
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<td>Oct 19, 2018</td>
<td>83.9 F</td>
<td>31</td>
<td>727</td>
<td>0</td>
<td>110</td>
<td>83</td>
<td>110</td>
<td>398</td>
<td>13</td>
<td>13</td>
<td>94</td>
<td>120</td>
<td>1,656</td>
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<tr>
<td>Sep 20, 2018</td>
<td>83.1 F</td>
<td>32</td>
<td>711</td>
<td>0</td>
<td>114</td>
<td>85</td>
<td>114</td>
<td>410</td>
<td>14</td>
<td>14</td>
<td>97</td>
<td>124</td>
<td>1,643</td>
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<tr>
<td>Annual Total</td>
<td>364</td>
<td>4,464</td>
<td>369</td>
<td>1,294</td>
<td>972</td>
<td>1,296</td>
<td>4,650</td>
<td>156</td>
<td>156</td>
<td>1,099</td>
<td>1,414</td>
<td>17,158</td>
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<tr>
<td>Monthly Average</td>
<td>30</td>
<td>372</td>
<td>32</td>
<td>108</td>
<td>81</td>
<td>108</td>
<td>388</td>
<td>13</td>
<td>13</td>
<td>13</td>
<td>92</td>
<td>118</td>
<td>1,430</td>
</tr>
</tbody>
</table>
Your Monthly Natural Gas Cost Breakdown

April 28, 2020 | Realistic, Cost Effective and Useful Artificial Intelligence in the Energy Industry
Your Monthly Estimated Natural Gas Cost by End - Use

<table>
<thead>
<tr>
<th></th>
<th>Last Year 04/22/2019</th>
<th>Last Month 03/23/2020</th>
<th>Current 04/21/2020</th>
</tr>
</thead>
<tbody>
<tr>
<td>Avg. Temp</td>
<td>56.5°F</td>
<td>50.2°F</td>
<td>62.6°F</td>
</tr>
<tr>
<td>Cost</td>
<td>$78</td>
<td>$127</td>
<td>$60</td>
</tr>
<tr>
<td>Therms</td>
<td>66</td>
<td>113</td>
<td>49</td>
</tr>
<tr>
<td>Days of Service</td>
<td>20</td>
<td>33</td>
<td>29</td>
</tr>
<tr>
<td>Avg. Daily Therms</td>
<td>2</td>
<td>3</td>
<td>2</td>
</tr>
</tbody>
</table>
Relevant Outbound Messaging

Informative proactive tips and rebates

Mid-month notification
Hi John Smith,

Thank you for using our Energy Advisor! There were several programs suggested to help you save based on your personal home profile.

One of these is our EnergyWise Attic Insulation Program. You can receive up to $300 towards upgrading your attic insulation by participating in this program. Learn more...

You can update your profile at any time. Click here to make changes or see more personalized savings tips!

Our mailing address is:
123 Main Street, Atlanta, Georgia

Want to change how you receive these emails?

Did you know you may be eligible for a rebate when you purchase a smart thermostat through our Utility Marketplace? Visit our website at www.utility.com/markplace and save up to 50% when you purchase a new thermostat.

Use our Programmable Thermostat Calculator to find the best thermostat settings to save energy and money!

Our mailing address is:
123 Main Street, Atlanta, Georgia

Want to change how you receive these emails? You can update your preferences or unsubscribe from this list.
Automated Marketing…
Relevant, Timely Engagement Throughout the Year

- Drive TARGETED program participation
- Increased visibility through planned, ongoing customer engagement
- Establishes loyalty, trust, builds Customer Satisfaction
Personalized Video Messages Proven Results:

- **99%** Recipients request *more* videos
- **97%** Rate videos very or somewhat USEFUL
- **37%** Click-thru rates …18 *times* Industry Standard
- **24 to 100** Point increases in JD Power scores
- **15%** Reduction in high bill calls
Add Personalize Elements

Expand Agenda
- Mid-Cycle Bill Alert engagement
- Rate Transformation to TOU/Demand
Residential Rules of Thumb

- Daily total kWh is generally useful
- TOU bucket data is generally useful
- Hourly data necessary for Demand Rates
- 15 minute data does identify end uses
- Most customers will not read graphs
- Engagement requires outbound and use video
Realistic, Cost Effective and Useful Artificial Intelligence in the Energy Industry
Customer Clusters & Campaigns

Messaging Intents **Precede** TOU or Demand Analysis

- Shadow Bill All Customers
- Annual Costs Higher? True: Higher in the Months? True: “Here’s how to reduce demand” or “Shift TOU Consumption” campaign
- Monthly Costs Higher? False: “You are winning!” perspective campaign
WELCOME to your VIDEO BILL EXPLANATION
Clear Monetization in Year One

• 15% **Reduction** in high bill calls to the call center
• 80-90% **Reduced** frivolous audit costs re high bills
• 25 - 100 **point Increase** in JD Power scores
• Improve EE and DR program **targeting** and yields
• **Increase** revenues with your online store
• **Promote** Heat Pumps and EVs
• Explain complex **pricing/rate transitions**
Innovation
If it can make your job easier, it can probably make it irrelevant.
SUMMARY

#1
You can Monetize Advanced Analytics

#2
Customer Bills Enable Ongoing Digital Engagement

#3
Interval Data works for Rate Transformation and Mid-Cycle Alerts

#4
15% call reductions 25-100 point+ CS
Any Questions
Upcoming Webinars

MAY - TBA 2020

“Relating New Rates Using Personalized Videos”

by:

Apogee Interactive, Inc.
Contact Us

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Thank You!