IN DEVELOPMENT FOR OVER TEN YEARS...

<table>
<thead>
<tr>
<th>Year</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>2008</td>
<td>Development of the Parsons Platform began in response to the spike in energy prices, when fuel oil jumped from $2.40 to close to $4.00 per gallon.</td>
</tr>
<tr>
<td>2011</td>
<td>HVT started to collect small-scale data on a real-time basis. This allowed us to respond to detected problems (such as improper boiler cycling) and make required adjustments.</td>
</tr>
<tr>
<td>2015</td>
<td>Establishment of data architecture and archive structure; hired in-house engineer and data specialist.</td>
</tr>
<tr>
<td>2018</td>
<td>Reduced costs of hardware coupled with cloud storage make the Parsons Platform ready for a rollout to the broader affordable housing community.</td>
</tr>
</tbody>
</table>
This is an example of how we have used it to diagnose issues.

Adjustments were made to the control logic and the Platform was able to demonstrate that the adjustments worked. The loop temperature is now running within the set points that will put less pressure on the compressors and has already resulted in reduced energy consumption and maintenance costs.

This large building was experiencing high electrical costs and lost 5 heat pumps ($6000 each) to compressor failure within 4 years of opening. We acquired data showing that the loop temperature was running abnormally, putting undue stress on the compressors, potentially contributing to premature failures and higher electrical costs.
Pumping rate is too high causing little temperature differential on supply – return delta.
SUPPORTS COMMISSIONING

AHU supplying fresh in excess of set point.
$200,000 SAVED ON A PROJECT

104-unit development in Bennington VT was slated to have a central wood chip heating plant with an output of 3.2 million BTUs.

When we shared Parsons Platform data from an existing comparable-sized building with the design team, they saw that the system as planned would have been significantly larger than necessary.

In response, the plans were redesigned to incorporate a 1.8 million-BTU plant instead. The change saved $200,000 in construction costs in the short term and be more efficient in the long term.
LESSONS LEARNED: RIGHT SIZING

- Geothermal system that has a 1,000,000 btu/hr capacity to heat and cool a 55,000 square foot building.

- This slide shows events during temperature ranges from 50 to 90 degrees during the year and corresponding capacity used for the chiller that heats and cools the water and pumps that move the water throughout the building.

- The data captured and displayed on the dashboard demonstrate that the chiller is only using 20% of its total capacity to cool the building even under peak cooling conditions of 90 degrees and the pump is only using 60% to achieve movement of the cooled water throughout the building.
LESSONS LEARNED: BUILDING OPTIMIZATION

- Monitoring Boiler Duty Cycles showed that boiler sequencing was in error and using more costly fuel source. The erratic cycling also stresses the components, potentially lowering expected useful life and lowering efficiencies.

- Points out the need to adjust the control logic within the building automation control system.
EXCESSIVE CYCLING

2 Boilers running less than 5 min intervals. Boilers would likely have failed in a few years costing approximately $50,000.
HELPS OWNERS & FUNDERS SAVE MONEY, BUILD MORE UNITS AND MAINTAIN AFFORDABLE RENTS

Real time analytics

- Correct system inefficiencies and errors and confirm system performance as specified at commissioning
- Continuously assure the full value of energy investments and sustain affordability.
- Provide key information on system performance that can significantly lower capital expenses and reduce total development costs on future projects.
- Reduce reliance on costly maintenance techs and engineers trouble-shooting “in the dark”, without data to back up proposed solutions or designs.

We provide a team of engineers and analysts that can be leveraged across all participants, saving our members organizational staff and consulting costs.