Super-Efficient, All-Electric New Homes Pilot: Consumers Energy-NRDC Collaboration

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Consumers Energy

Michigan IOU
• 1.8 million electric customers
• 1.7 million gas customers
• Only partial overlap

Most recent IRP
• 80% CO2 reduction by 2040
• Coal plant retirements
• Capacity replaced w/EE, DR, renewables

Increasing and aggressive EE targets
Natural Resources Defense Council

Non-profit environmental advocacy group
• Offices in NY, Washington, San Fran, LA, Bozeman, New Delhi & Beijing
• 3 million members; ~600 Staff
• working on climate, energy, water, land, and wildlife issues.

Midwest Office opened in Chicago in 2007
• Importance of Midwest to clean energy future
• 400,000 members in the region

Extensive energy work in Michigan
• Efficiency planning
• Demand response planning
• Integrated resource planning
• Distribution system planning

• Regulatory proceedings
• Legislation
• Stakeholder processes
• Direct utility engagement
Pilot Timeline

- **Phase 1: Affordable Housing Demonstration Projects**
  - Spring 2020 thru Spring 2021
  - $362k design/implementation + $150k incentives
  - Kalamazoo Neighborhood Housing Services partnership
  - 4 single-family homes (completion expected soon)

- **Phase 2: Market Rate + Income Qualified Pilot**
  - 2021 thru 2022
  - Goal of 50 homes
  - $209k implementation + $375k incentives

Evaluation of energy impacts, customer comfort, builder feedback, etc. at applicable points in time
Pilot Concept

• Part of solution to climate concerns
  • Aligns w/Consumers IRP goals for carbon emissions reduction
  • Integration of EE and RE

• Test performance in MI climate
  • Energy
  • Comfort

• Test potential builder interest
  • Affordable/subsidized housing
  • Market rate housing
Program Requirements

- HERS efficiency rating of 40 or lower
- Certified “cold climate” air source heat pump
- PV-ready
  - DOE ZERH checklist
Recommended Efficiency Measures

<table>
<thead>
<tr>
<th>Home Component</th>
<th>Recommended Measure</th>
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<tbody>
<tr>
<td>Air-Source Heat Pump or Mini-Split Heat Pump*</td>
<td>Selected from NEEP’s ccASHP Product List</td>
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<tr>
<td>Whole-Home Ventilation</td>
<td>HRV or ERV</td>
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<tr>
<td>Heat Pump Water Heater</td>
<td>UEF 2.00+</td>
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<tr>
<td>Infiltration</td>
<td>1.50 ACH or less</td>
</tr>
<tr>
<td>Insulation</td>
<td>Ceiling/Attic Insulation R-Value: 60+</td>
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<tr>
<td></td>
<td>Wall Insulation R-Value: 30+</td>
</tr>
<tr>
<td></td>
<td>Basement or Slab Insulation R-Value: 20+</td>
</tr>
<tr>
<td>ENERGY STAR Certified Windows</td>
<td>U-Value: 0.20 or lower</td>
</tr>
<tr>
<td>Cooktop</td>
<td>Induction</td>
</tr>
<tr>
<td>ENERGY STAR® Certified Appliances†</td>
<td>CEE Tier II</td>
</tr>
<tr>
<td>ENERGY STAR LED</td>
<td>100% LED</td>
</tr>
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*For Non-Ducted systems: HSPF >10. For Ducted systems: HSPF >9, COP @5°F >1.75 (at maximum capacity operation), SEER > 15
†Tier II – This level signifies energy efficiency at 25% above government mandate

HERS 40 is an efficiency performance standard, so these are just recommendations. Builder can use alternative mix of measures.
Working Together to Build a Better Future
A Scalable / Replicable Model for Accessible Clean Energy Solutions in LMI Communities

KAHP seeks to provide high-quality homes built by HBA members that are both attainable in cost and provide the homeowners with low maintenance costs. KAHP is an umbrella program comprising the Kalamazoo partners. [https://www.kalamazoohomepage.com/kahp-information](https://www.kalamazoohomepage.com/kahp-information)

HBAWMI members build attainable homes in Kalamazoo’s underserved neighborhoods. The HBA has developed “house in a box” designs that integrate the most efficient construction possible. By partnering with member suppliers, HBA members can provide high-quality materials at discounted pricing. [https://www.kalamazoohomepage.com/](https://www.kalamazoohomepage.com/)

KNHS is the builder fiduciary and pass-through for Consumers Energy incentives. KNHS is a non-profit offering a variety of specialized loan products and financial education services to LMI customers. [https://knhs.org/](https://knhs.org/)

The Local Initiatives Support Corporation is a Community Development Financial Institution (CDFI) that offers financing during all stages of projects — predevelopment, property acquisition, construction, and permanent. [https://www.lisc.org/kalamazoo/](https://www.lisc.org/kalamazoo/)

The Foundation for Excellence provides the buy-down subsidy. A unique innovation by the City of Kalamazoo and private donors to address systemic challenges to the prosperity of the city and fund aspirational community projects. [https://www.kalamazoocty.org/ffs](https://www.kalamazoocty.org/ffs)

MARKET TRANSFORMATION OBSERVATION Although Energy Star certification is not a program requirement, the Kalamazoo partners are leveraging this opportunity to pursue certification, which enables them to tap into mortgage funding, strengthen the pipeline of qualified HVAC contractors and bring distinction to their community initiative.
Phase 1 All-Electric Demonstration Homes

AFFORDABLE SINGLE-FAMILY HOMES | SUPER EFFICIENT NEW CONSTRUCTION | 1,440 SQ. FT. | 2-STORY

$16,000 Incentive for Electric Measures & Envelope Upgrades
$24,000 Incentive for Rooftop Solar PV*

Each home features:
- Industry leading cold climate heat pumps by Mitsubishi or Fujitsu
- Intelligently designed 8.45 kW-DC rooftop solar PV system*
- Energy Star® appliances
- Energy Star® triple-pane windows
- Comprehensive air sealing and premium insulation (R-25 wall with 2" spray foam and R-60 ceiling)
- 240V outlet for fast electric vehicle charging
- 3 BR, 2.5 Bath or 4 BR, 3 Bath builds

*Because of its orientation and limited suitable roof space, the solar PV system on the 4th home was limited to 5.2 kW with a $15,500 incentive.

These all-electric spec homes use the same floor plan as their 2019 dual fuel counterparts, providing EM&V opportunities.

Check out a Virtual Tour of the 2019 Dual Fuel Home
Forecast of Near Zero Net Energy Because of PV

• Drive homes as close as feasible to zero net energy (ZNE) on an annual basis
• Set annual solar electricity output at ~ 85% of expected on-site consumption (on first three homes), to avoid over-producing annually in violation of utility tariff rates. Set at lower % on fourth home due to roof orientation and shading.
1015 ALBERT AVENUE
This home has since been framed and roofed. It’s ready for rough plumbing, mechanical and electrical.

118 FELLOWS AVENUE
This home has enough suitable roof space to host an 8.45 kWdc solar PV system.

Energy Star triple pane windows help create an efficient envelope. This window header is framed to accommodate insulation. Caulking gaps and spray foam insulation will help create airtight home.

Images taken 12/29/2020

124 BURR OAK STREET
View of the main living space which includes kitchen with peninsula, powder room, large pantry and 2 closets. This home has 3 bedrooms upstairs and rough plumbing for a basement bathroom. A 2-ton Fujitsu cold climate ASHP with ERV will be installed in this home.

Drywall, finishes and the rooftop PV system are next.

Images taken 12/29/2020
Phase 1 Modeled Results

**HERS® 43**
HERS index dropped 20 points with the planned measures. With the addition of solar PV, these homes can reach a HERS index of 15.

**50 MMBtu**
Annual energy savings per home before the addition of solar PV when compared to baseline dual fuel home.

**59%↓**
Reduction in gross energy consumption before addition of solar PV system when compared to baseline dual fuel home.

**78%↓**
Reduction in annual energy costs to the customer with the addition of a rooftop solar PV system.

These all-electric spec homes use the same floor plan as their 2019 dual fuel counterparts, providing EM&V opportunities. Check out a Virtual Tour of the 2019 Dual Fuel Home shown above.
## COVID Challenges and How Addressed

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<tr>
<th>Challenge</th>
<th>Steps taken</th>
<th>Outcome to date</th>
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| **In-Person Builder Engagement** | Held cameras-on video conferences and frequent communications via email and phone. | • Strong interest in building all-electric. KNHS intends to commit to 8 IQ homes.  
• HBA-WMI raised interest in another 8 units with other developers for 2021.  
• Electric homes featured on HBA-WMI website and in podcasts. |
| **Permitting & Inspection Delays Due to Disruption in Municipal Functions** | Implemented flexible incentive structure for Phase 1  
• Initial payment at builder signing.  
• Final at CofO contingent on QA/QC. | KNHS has worked with us to meet payment requirements through timeline shifts and granted us access to the homes for QA/QC to stay on track. |
| **Material Cost Increases**      | Allocated 15% additional budget to cover prices increases in Phase 1.         | Not used to date on incentive measures.                                                                                                      |
| **Supply Chain Disruptions**     | Worked with builders to source alternatives and revise schedules as needed.  | No meaningful impact to home performance  
• Swapped new tech thin-triple pane windows for Energy Star triple-pane windows.  
• Fujitsu ccHP condenser units delayed until January due to availability.  
• HPWH was initially slated for a 3-month delay. Arrived within weeks of order and stored by builder. |
Recruiting Effort

Tier 1
- Homebuilders and rating companies currently participating in Residential New Construction program

Tier 2
- Collaboration with Stakeholder Groups (Green Home Institute)
- Outreach through HBA's

Tier 3
- Contractors & Distributors (e.g., Mitsubishi, Fujitsu)
- Webinar opportunities
Myself, Dan Martz and Kevin Osborne were excited to learn and work with new technology to us on these four Pilot Project homes. None of us had experience with an all electric home or a home with solar power. The Consumers/ICF team has been great to work with providing coaching, organization and structure allowing us to build and learn effectively. All of us have learned about new systems and building better, more energy efficient homes that will be comfortable and save the homeowners money every month. We all look forward to continued learning and working with Consumers/ICF on future projects.

Aaron Hovestadt
Managing Partner, LandMark Homes of Michigan
President, HBA of Western Michigan
What’s Next?

▪ Continue to evaluate opportunities to scale:
  ▪ Decrease administrative costs
  ▪ Decrease incentive amounts
  ▪ Increase participation

▪ Measurement & Validation
  ▪ Energy bill impacts
  ▪ Heat pump performance
  ▪ Customer comfort
  ▪ Builder barriers
  ▪ Cost-effectiveness
  ▪ Builder & Customer Interviews

▪ Collaboration with Renewables Team or C&I Offering

▪ Expanding Pilot to a Second Phase
These requirements were adapted from the EPA’s Renewable Energy Ready Home Solar Photovoltaic Specification Guide. This guide can be accessed on the DOE Zero Energy Home program website.