

GHP: The Future of HVAC

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The Simple Climate/Environment Solution

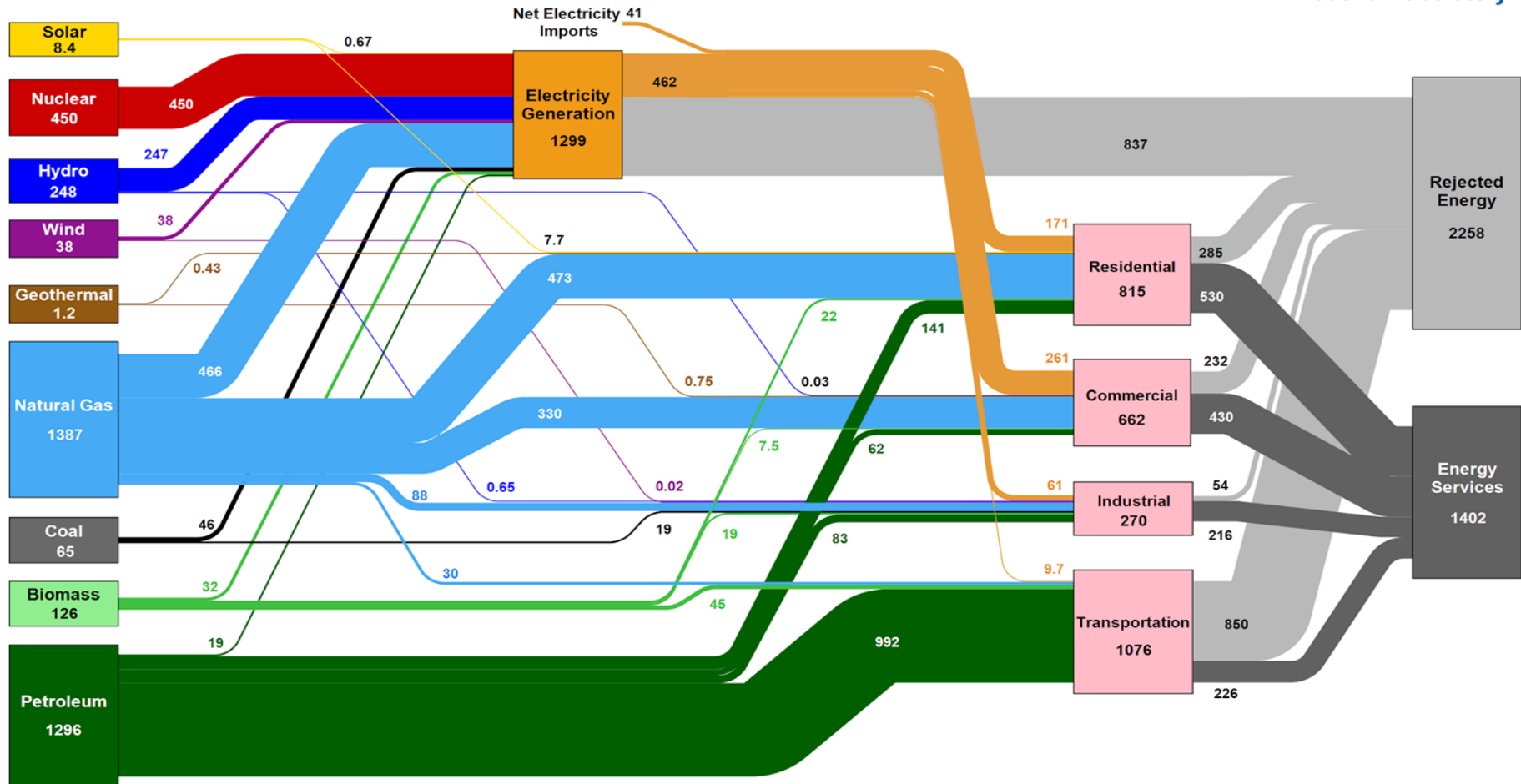
By 2050:

1. Decarbonize electricity production (-20% of NYS emissions)
2. Adopt Environmentally **Beneficial Electrification** (-73% of NYS emissions)
 - Adopt Electric Vehicles (-41% of NYS emissions)
 - Convert from furnaces to Heat Pumps (-32% of NYS emissions)

This will be:

- The **“Second Great Electrification of Our Society”**
 - Electricity consumption may double
 - Emissions will drop dramatically
 - Energy Efficiency will increase dramatically
 - Energy will be cheaper for all

New York Energy Consumption in 2014: ~ 3660 Trillion BTU



Source: LLNL August, 2016. Data is based on DOE/EIA SECS (2014). If this information or a reproduction of it is used, credit must be given to the Lawrence Livermore National Laboratory and the Department of Energy, under whose auspices the work was performed. Distributed electricity represents only retail electricity sales and does not include self-generation. EIA reports consumption of renewable resources (i.e., hydro, wind, geothermal and solar) for electricity in BTU-equivalent values by assuming a typical fossil fuel plant heat rate. The efficiency of electricity production is calculated as the total retail electricity delivered divided by the primary energy input into electricity generation. End use efficiency is estimated as 65% for the residential sector, 65% for the commercial sector, 80% for the industrial sector, and 21% for the transportation sector. Totals may not equal sum of components due to independent Rounding. LLNL-MI-410527

Scaling the Industry to meet the challenge

GHP industry will scale up from a low volume to a high volume industry:

- Move from “one-building-at-a-time” to retrofiting of communities and clusters in order to gain economies of scale
- Target markets in sequence with easy-to-understand, cost-effective, standard solutions (i.e. \$20k flat-price to replace warm-air oil heat)
- Provide third-party ownership (i.e. like solar leases) for ground loops
- Deploy more cost-effective drilling technologies and processes

Very little, if any, need for “invention” and **it is all profitable today.**

(Note: Dandelion Energy Inc. is working on all these issues.)