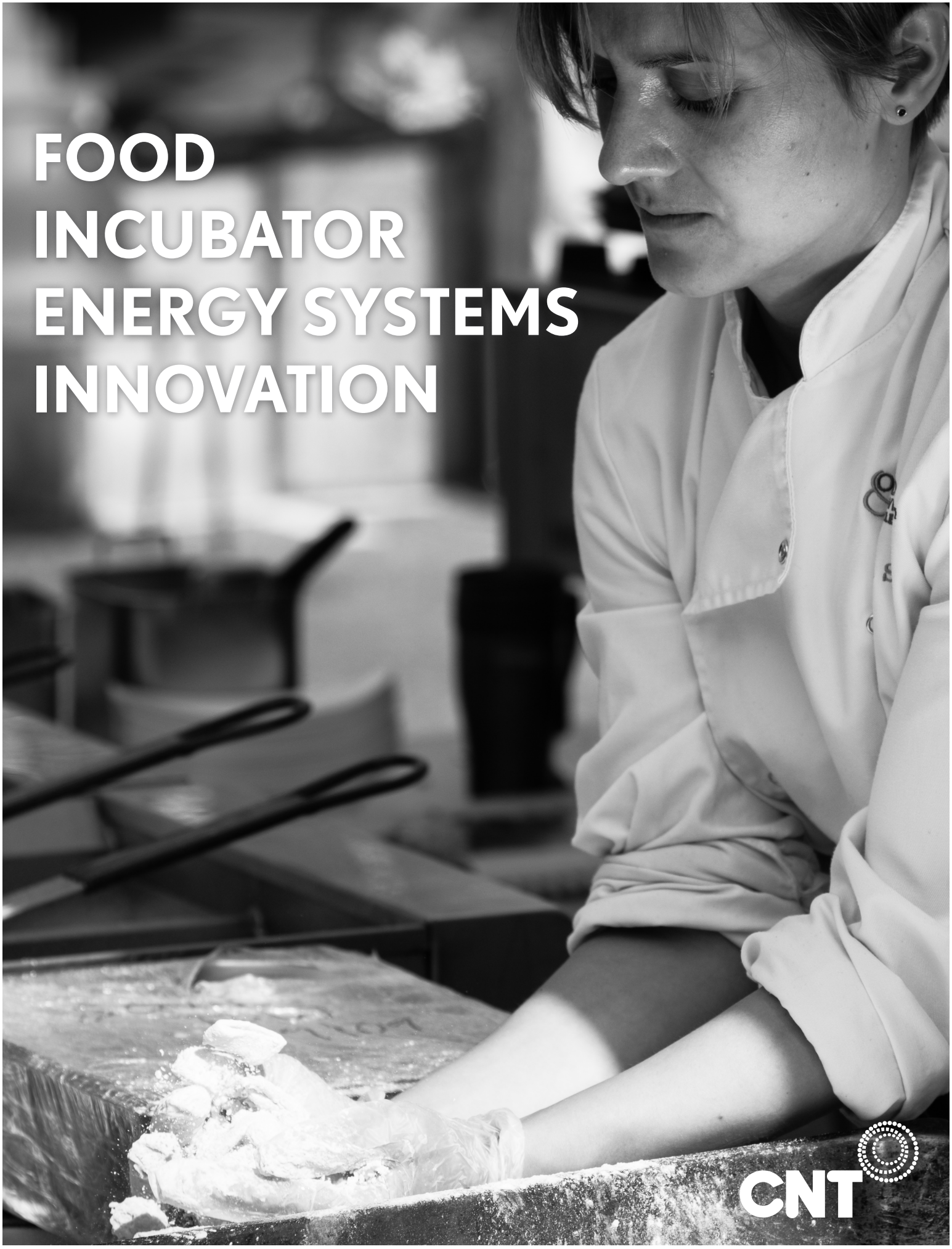
FOOD
INCUBATOR
ENERGY SYSTEMS
INNOVATION
CNT

Food Incubator Energy Systems Innovation

PREPARED BY
THE CENTER FOR NEIGHBORHOOD TECHNOLOGY

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INTRODUCTION

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With the recent uptick in manufacturing around the United States, the importance of food manufacturing to local economies has come into focus for its roles in creating jobs and building on the local culinary and cultural assets of a community. With this focus has arrived an interest in supporting food manufacturing entrepreneurs as they start and grow their businesses. As a result, food manufacturing incubators and shared commercial kitchens are sprouting up in cities around the county.

Food facilities present unique challenges for energy use and sustainability. The intensive energy use of food manufacturing equipment and the slim margins of the food business mean that every small gain in efficiency can be crucial to the long-term viability of a food producer. An incubator or shared use environment adds an additional layer of complexity as the exact occupancy and usage patterns of the space are not dictated up-front and will change over time—the space for a start-up baker today may next year be the home of a juice company. Moreover, managing energy costs and demand in any incubator system are challenging because there is not a single point of command and control to fine tune the system, but rather the many independent business operators are making individual decisions about their use of the facility. While this poses a unique challenge, there is also potential to use tenant turnover as opportunity for continuous upgrades to equipment, training, and operational practices. With a goal of continuous improvement, the incubator 5 years from now could be much more energy efficient than when it first opens.

To explore these issues, the Center for Neighborhood Technology convened a group of experts in December 2016 to workshop potential energy savings for the Hatchery, a food manufacturing incubator in Chicago. The goals of the workshop and this resulting white paper were 1) to help the Hatchery team make the operations as efficient as possible and 2) to share the workshop findings with the broader food manufacturing incubation industry to build understanding of the best energy saving options for such operations.

About the Hatchery

The Hatchery is a cutting edge incubator for Chicago's food industry which will be built at the Kedzie Green Line El Stop on Chicago's Near West Side.

The Hatchery, as designed, will be an 80,000 square foot facility designed exclusively for food start-up companies. It will have 50 to 75 spaces ranging from 400 to 800 square feet each, which are large enough to permit the first year or so of company growth; companies will graduate out of the incubator into larger industrial spaces. At the time of the workshop and this writing, the schematic design phase for the facility was just completing and final design was gearing up.

The Hatchery is breaking new ground both locally and nationally for food business incubation, which is a growing sector in the Chicago economy and in other cities around the country. It will show how small scale food manufacturing, with the right support, can expand rapidly, meeting the growing demand for locally-sourced food and generating much-needed entrepreneurial and job opportunities. Designing the Hatchery with world-class energy efficient equipment, systems, and practices will make the incubator more cost effective, send the entrepreneurs down the right road for their futures, and raise the facility's profile as a sustainable, innovative resource. The recommendations in this document are designed to help the Hatchery achieve its goals and provide information to others in the food production and incubation fields.

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About the Workshop

The Center for Neighborhood Technology and Navigant organized this half-day workshop to review the energy strategies for The Hatchery and identify the full range of potential innovations. The result of the workshop is a set of recommendations for the Hatchery highlighting best practices for the growing food manufacturing incubation field around the country. A list of workshop participants is provided as an appendix.

Workshop Participants

The Hatchery is a joint venture of Industrial Council of Nearwest Chicago, a 49-year old industrial incubator that manages a 416,000 square foot facility with 110 tenants in the Kinzie Industrial Corridor, and Accion Chicago, a non-profit that helps communities grow by investing in people who build businesses and generate jobs in their neighborhoods, which will be located at The Hatchery. Wight & Company is the Hatchery's architect.

This consultation is led by the Center for Neighborhood Technology (CNT) and Navigant.

- **CNT** is a 38-year old innovation center for urban sustainability working in energy, transportation, water and the built environment. CNT sees The Hatchery as an opportunity to demonstrate cutting-edge energy technologies and inform similar innovations around the country.
- **NAVIGANT** is a specialized, global management consulting firm that supports leading energy companies address their most complex business opportunities and challenges. In particular, Navigant's energy team works with utilities, manufacturers, and government agencies to improve energy efficiency throughout the food industry.

FOOD SERVICE ENERGY USE

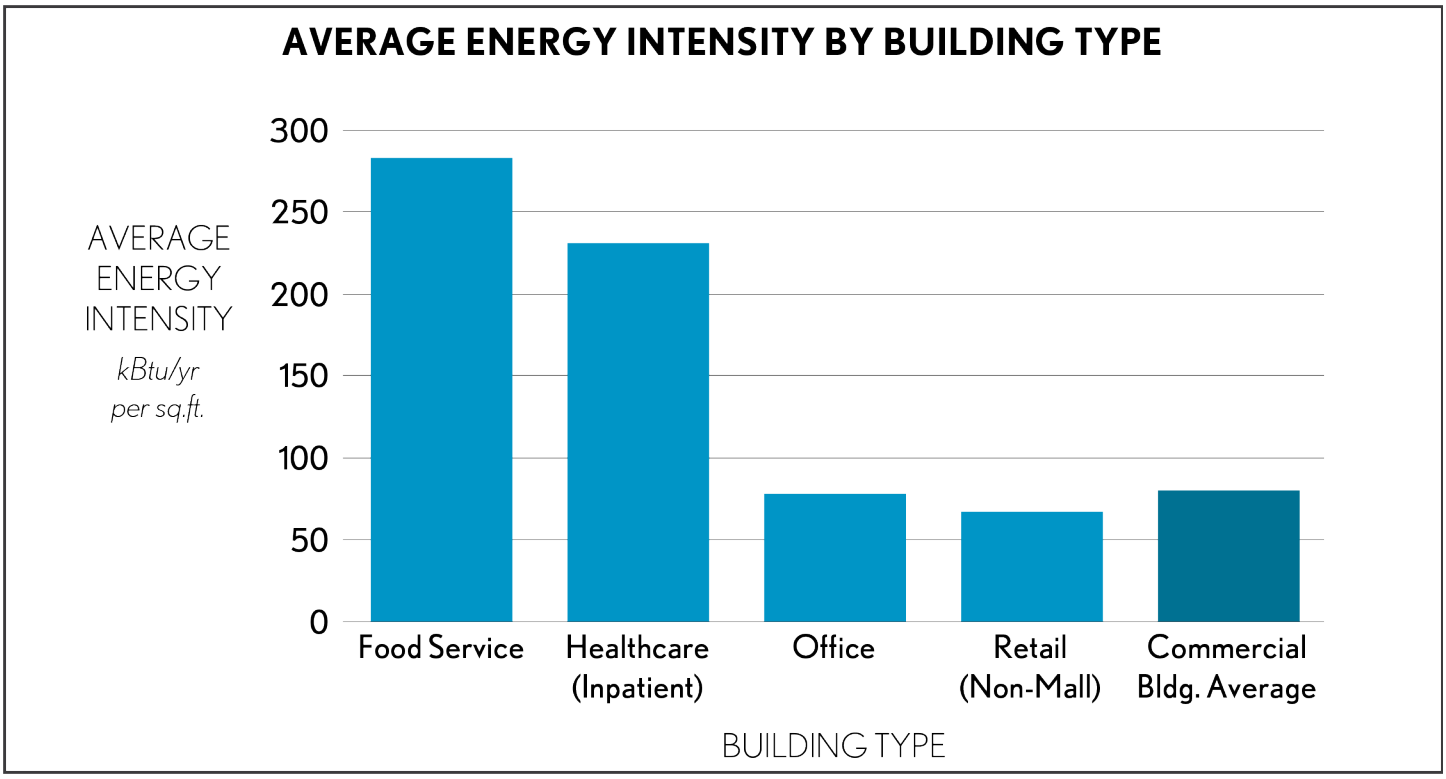
Energy Intensity

In many ways, a commercial kitchen is like a small factory with its production cycles and energy intensive equipment. Food service buildings are the most energy intensive of all commercial building types according to the U.S. Department of Energy.[1] Long hours of operation and many large energy loads for cooking, refrigeration, ventilation, and water heating contribute to food service buildings having over three times the energy intensity (annual energy usage per square foot) as office or retail buildings.[2] When considering the just the kitchen portion of a food service facility, that energy intensity is likely even higher.

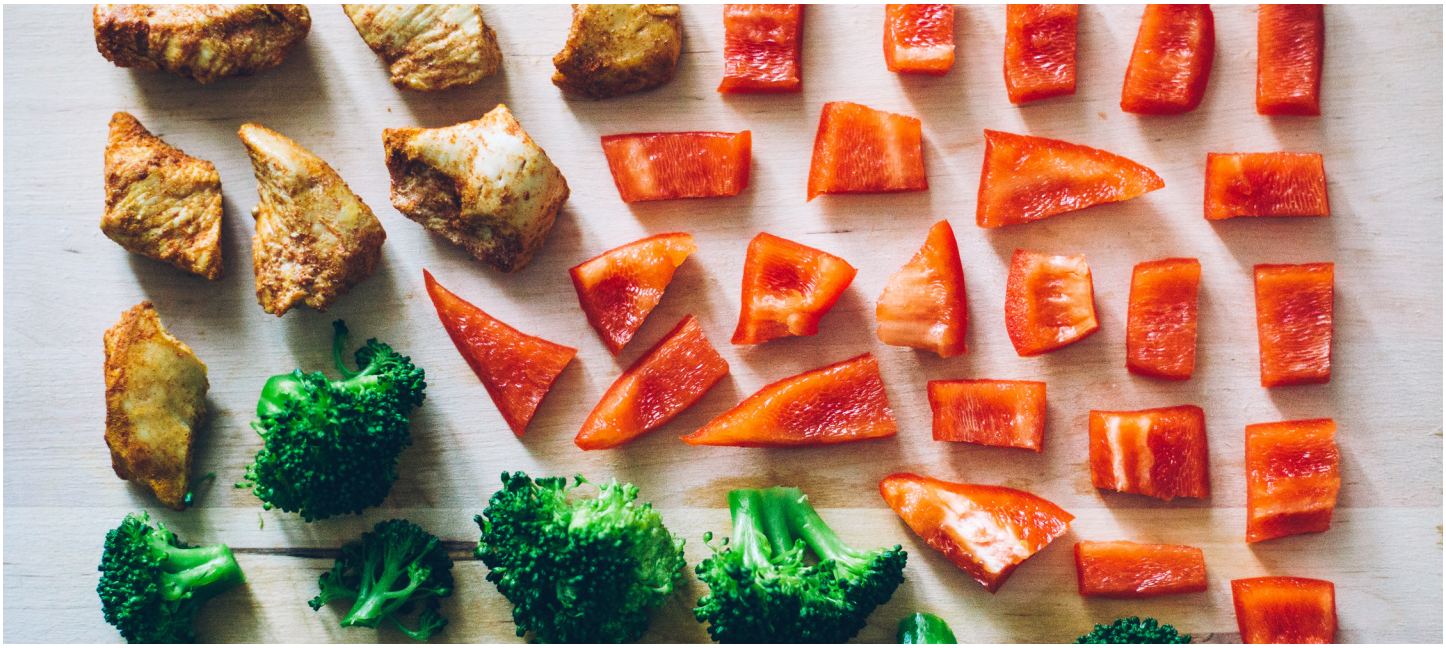
Unique Requirements

Food service facilities have specific requirements that any energy improvements must meet. In addition to strict building and fire safety codes, individual producers may have business needs that affect equipment choices and facility design. For example, ventilation that ensures kitchen odors are not allowed into dining or retail spaces or air handling that isolates spaces that are producing foods that are specifically allergen-free.

Food manufacturers may be able to create a production schedule that enables demand management practices, such as bundling equipment use—scheduling all tasks requiring an oven together, so it does not need to be heated more than once, for example—or taking advantage of off-peak energy prices, but this is less likely to be the case for food that is cooked to order, such as for catering.



1. U.S. Department of Energy, Energy Information Administration, 2012 Commercial Buildings Energy Consumption Survey, Table C4. Sum of major fuel consumption and expenditure gross energy intensities, 2012. Updated December 2016.
2. Ibid



A System for Success

As with any energy intensive facility, energy demand reduction must be designed into the facility from the start to get the most benefit. Choices made up front can determine energy use for years to come. A highly efficient large piece of equipment like a walk-in cooler might cost more upfront but the difference can be paid for many times over with energy savings. Not designing for efficiency creates an "energy debt" that will eat away at the bottom line for years to come. Even if energy bills are just a small share of the high operating costs of a food business, reducing them can help with cash flow and long-term viability.

However, perhaps most important of all, food producers are there to make good food, not to spend time analyzing energy use data or optimizing air handling systems. So unless an energy improvement is of the "set it and forget it" type it must be extremely simple to manage, or offer enough of a payback to justify engaging an expert periodically.

A 2010 paper prepared by Pacific Northwest National Laboratory (PNNL) and several industry experts examined the energy savings potential for a hypothetical quick-service restaurant.[3] Compared to business-as-usual facilities at that time, the researchers found the potential for 40-50% energy savings with payback periods of 1.5-3.5 years, depending on climate region. Improvements in equipment efficiency and sustainable building design in the years since could drive savings even higher.

There are four key steps in designing and maintaining energy savings into a food operation:

- **EFFICIENT EQUIPMENT** that is correctly sized and designed for the operation. The ENERGY STAR product certification program is a good standard for many types of equipment, such as: commercial dishwashers, refrigerators and freezers, ovens, fryers, griddles, water heaters, and HVAC equipment.
- **EQUIPMENT CONTROLS** that limit waste by only using as much energy as is needed when it is needed, e.g. occupancy sensors and demand controlled ventilation.
- **OPERATIONAL PRACTICES AND SCHEDULING** that uses the right equipment for the right task, operates at efficient settings, and ensures it isn't turned on until it is needed and is shut down promptly when finished.
- **MAINTENANCE AND REPAIR,** including regularly or seasonally scheduled activities to make sure equipment is operating at its best.

These steps are not a linear, one time process, but rather an ongoing cycle that must involve a management process that includes planning, monitoring, benchmarking, continuous improvements, and training for new staff or on new processes.

3. Zhang et al. 2010. "Technical Support Document: 50% Energy Savings for Quick-Service Restaurants." Pacific Northwest National Laboratory. September 2010.

FOOD MANUFACTURING INCUBATOR CASE STUDY: THE HATCHERY

Expected to begin construction in 2017, the Hatchery will be 80,000 square foot and have individual kitchen spaces for up to 75 food production business startups that will use the facility for 1 to 3 years before graduating to larger facilities of their own. The Hatchery will also include a shared kitchen for clients and office space for project partner Accion Chicago—a nonprofit microfinance organization.

The concept for the Hatchery arose out of founder ICNC's existing light industrial growth-stage incubator, a 416,000 square foot facility that has been successfully helping start businesses since the 1980's. A common type of user at the business incubator is food service, but kitchens require so much specific build-out of the space that an additional separate, dedicated space for food production began to make sense. Some key considerations when making recommendations for energy improvements at the Hatchery:

- As a nonprofit-run enterprise, the Hatchery has to manage upfront capital and ongoing management costs carefully, and all of the partners have a strong interest in getting the project built out quickly.
- With new construction the facility can build in some efficiencies that might not be available to a pre-existing building, such as smaller kitchen bays, separated cold storage, and use of daylighting.
- Tenants will be providing much of their own equipment and the type of food-manufacturing in the spaces will change over time as tenants graduate.
- The incubator does more than just provide businesses space—it also offers training and collaboration opportunities, which could include energy efficiency and demand management curriculum.

The Hatchery facility is being designed as 4 pre-cast concrete boxes. Individual kitchens will be available in multiple sizes to accommodate different business types. The kitchens are grouped into "pods" and share a utility wall. There will also be a large shared kitchen, a break room, seminar room, and open office for tenants. Shipping, receiving, cold storage,and room temperature storage are all consolidated into an adjoining existing building. This separation of uses allows cost savings for mechanical equipment, and shipping and receiving directly into the storage area simplifies logistics for the businesses.

Most of the building's energy use will be dictated by the activities of the tenants, which in an incubator are largely unknown during the design phase and will change over time. The energy load for the facility can be estimated using some basic assumptions, but occupancy, work hours, and energy use intensity are changeable and will play a big role in the financial return on investment of any upfront energy improvement—a kitchen used just 6 hours a day will have a very different energy profile than one used 18 hours a day by 3 different startups. As energy demand charges are a big portion of utility bills, it is in the interest in of the incubator management to help lower and smooth out tenant energy demand. As the Hatchery moves forward it could decide to create a portfolio of tenants that helps balance out energy demand.

Building Envelope and Metering

Chicago's hot summers and cold winters make the building envelope an especially important part of energy efficient design, but a building envelope that supports efficiency is critical in most places around the United States. As the majority of the Hatchery building will be pre-cast there is a good potential to build in a strong R-value (a measurement of thermal resistance or insulating ability). The roof is planned to be a flat membrane, with a higher insulating R value than the minimum required by the building code. The building is not planned at this point to meet LEED rating standards (the U.S. Green Building Council's Leadership in Energy and Environmental Design certification); architect Wight & Company has their own sustainability standards.[4]

4. Many facilities struggle with whether to pursue LEED certification given the costs additional upfront costs involved. It is true that an experienced team of engineers and architects may be able to generate the same energy savings or more for a building without the LEED rating. But, the LEED program provides a useful framework for applying a broad set of sustainability principles in a systematic way and is a recognizable brand that is valued by many investors and tenants. Such ongoing benefits should be carefully considered as they may outweigh upfront costs.

There will be a clearstory for daylighting in the office and central areas. Some of the kitchens themselves will get daylighting from interior glazing along the main hallway, but they will not have daylighting themselves, and others will not have any glazing to allow for privacy. Lower ceilings in the kitchens will help with airflow. It is expected what glazing there is will have a high U value, but no solar tinting or nighttime insulation is planned. Recommendations for utility metering are also included in this section, as it will affect utility use throughout the whole building.

BUILDING ENVELOPE AND METERING RECOMMENDATIONS

- The thermal integrity of the building shell is very important—if there is room for a super-insulated roof deck it should be looked into. The benefits are more or less permanent for the life of the building and can offset upfront costs.
- The loading dock is a big infiltration area and will be sending and receiving shipments from large trucks, small trucks, and vans all day. Dock door seals and improved automatic high-speed garage doors can help reduce the energy impacts.
- If design allows it, it is helpful to partition the loading dock area from the other spaces.
- Logistics management for shipping and receiving can improve efficiency for the tenants and reduce energy use caused by unnecessary idling and open garage bays. Scheduling software programs exist to help with this. In a large facility an on-site staff coordinator for shipping and receiving may be cost effective.
- Helping tenants coordinate orders with common suppliers and shipping vendors, including buying staples in bulk and consolidating outgoing shipments, can create efficiencies and savings.
- Tubular skylights or solar tubes may be a good way to allow natural light into the kitchens without taking up a lot of roof space, but these should be tested to ensure that they do not introduce leaks in the conditions of negative airflow that will likely exist in the kitchens.
- Smart glass, or dynamic glazing, which automatically blocks light during very hot or bright periods, should be investigated as a way to reduce cooling loads while retaining daylighting benefits in the glazed areas.
- Where there are not competing roof space needs, operable skylights can allow passive cooling for the office and non-cooking areas that will not face interference with ventilation systems and make-up air.
- Clear feedback is essential to helping both the building owner and tenants manage energy and water use and costs. Good usage data can let a business owner know if equipment is being turned on before it is needed or not shut down properly. Energy and water metering for each individual kitchen space is a big cost, but without some form of submetering it can be impossible give detailed and timely feedback on usage.
  - The Hatchery is designed to submeter each pod of 8 kitchens, and each pod has its own electrical panel, which will help management track down major issues. New technologies can use sensors and monitoring software to track usage patterns at a finer grain without the expense of additional metering, but these are less available for natural gas applications, and gas typically makes up a large share of kitchen energy use.
  - Reporting usage data from the kitchens or pods to everyone in the facility could encourage learning about energy and water issues. Pods could even be rewarded for improvements or encouraged to "compete" against each other for savings. Many buildings are now displaying this type of information with a screen of dynamic graphics in a common space.
  - Tracking demand in addition to total usage is important, because the management will be paying the utility bills for the whole building and demand charges will be a big part of that bill.

Heating Ventilation & Air Conditioning (HVAC)

Commercial kitchens generate a lot of heat and require significant ventilation, which increases the amount of air that needs conditioning and adds to the energy load with exhaust fans. The need to isolate each kitchen in a food manufacturing incubator like the Hatchery to contain odors and avoid cross contamination for specialty manufacturers, such as gluten free bakers, limits the ventilation solutions available to the facility. Exhaust hoods are major components of commercial kitchens, but the Hatchery designers have found that not every food manufacturer requires one—a raw food company or ice cream maker generally isn't generating heat exhaust.

HVAC RECOMMENDATIONS

- Exhaust hoods cost thousands of dollars and use a great deal of energy, so it makes sense to avoid installing them in every kitchen if not all food manufacturing startups will need them. Similarly, if a number of manufacturers are likely to be bakers or others who can use a less expensive Type 2 hood instead of a Type 1 hood that handles grease there is a potential capital savings by limiting the number of kitchens with Type 2 hoods. Kitchens cannot share exhaust systems for fire safety reasons, but grouping the kitchen types could help with energy management.
- If synergies can be found by pairing kitchens it may make sense to group use types—a high heat producer could be housed next to a baker that needs a warmer room temperature.
- A shared makeup air system could create efficiencies, but with the kitchens running on different schedules systems will need to be modular to avoid conditioning unoccupied spaces.
- Heat recovery on exhaust can produce energy savings and demand control ventilation should be examined for their payback. Heat recovery can be used to pre-warm make-up air. A condensing burner system can create additional energy savings, but may not yet be standardly available for a kitchen application.
- Automated systems, including automatic shutoffs, improve efficacy and avoid waste. In small kitchens like those at an incubator, balancing the exhaust and makeup air is essential to avoid drafty uncomfortable kitchens or those with such negative pressure that it is hard to open the door. A system where exhaust and makeup equipment synchronize can create savings and improve comfort.
- Off-peak heating or cooling solutions can help shift energy demand to less expensive periods. A thermal storage system can be heated or cooled at night and then used over the course of the day. Solar heated hot water could be used for cooking, production, or space heating purposes. A time of use energy rate tariff can improve the cost effectiveness of this kind of demand management.
- Radiant floor heating and cooling are becoming popular solutions for space conditioning, and may be suited to the office and common areas of the Hatchery, but may not be a good fit for commercial kitchens where a lot of air is being brought in for ventilation and the system would be competing for floor space with waste lines.
- While not a good fit for the Hatchery's individual kitchens, for common areas and offices, ceiling fans can keep spaces comfortable and allow less use of the cooling system.
- A major innovation would be to consider an alternative heat source for the building. Some food manufacturers are now exploring on-site anaerobic digestion, although the unpredictable volume of food waste at a start-up incubator may make this a challenge. Geothermal energy technology for use in urban areas is growing. The proximity of other large energy users to the Hatchery site, including the CTA station could provide opportunities for a shared energy facility, such as a co-generation plant.

Appliances

At the Hatchery, most of the kitchens will be provided to the resident food manufacturing businesses without appliances, so the business can set up the space for their particular needs. This creates a significant challenge for the facility's ability to control energy use. The spaces will be provided primarily as a shell with a utility wall, electrical feeds from the hallway and pull boxes by each door, casework (e.g. cabinetry and counters), a sink, and in some kitchens, an exhaust hood as discussed in the HVAC section of this document. Appliance choices are crucial, because not only do kitchen appliances use a great deal of energy, but the waste heat an inefficient appliance gives off will increase the HVAC needs of the facility.

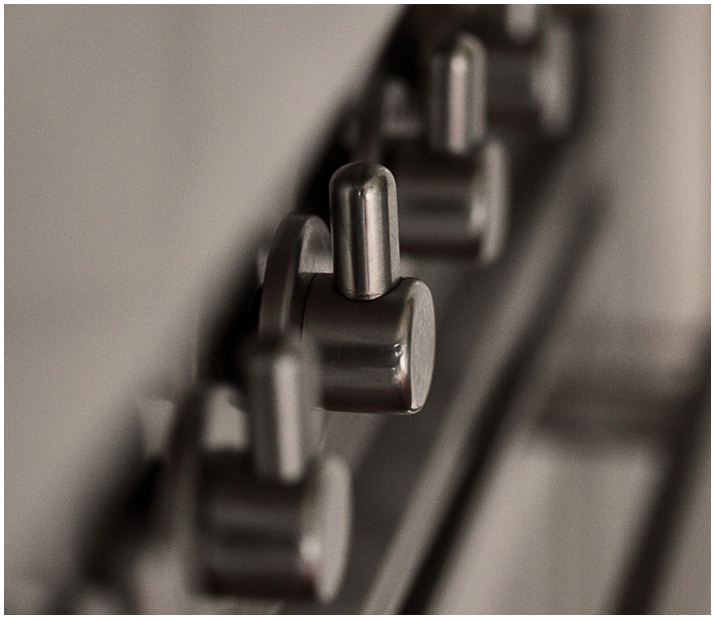


Photo: Gisella Klein, Flickr/Creative Commons

APPLIANCE RECOMMENDATIONS

- With so much uncertainty about tenants' appliance needs at an incubator, education of tenants to help them make smart energy choices is crucial. Management can help prospective tenants understand the lifecycle cost/benefit tradeoffs of a piece of equipment with low upfront capital cost, but high energy or water use. Providing a list of recommended efficient equipment by food manufacturing business type or a set of recommended vendors with efficiency knowledge before a tenant builds out their space could save everyone time and money. A partnership with a bank for affordable financing would also be helpful.
- Many local natural gas, electric, and water utilities offer rebates for food service appliances. For example, the city of Chicago's utilities ComEd, Nicor Gas, and Peoples Gas offer rebates for equipment applicable to the Hatchery.[5]
- If possible, passing through energy use and demand charges proportionally to each kitchen or tenant based on real energy use data would help food manufacturers understand the real costs of their processes.
- Similarly, training food manufacturers on appliance usage and maintenance techniques to save energy would pay dividends. This includes providing information on which equipment is the best choice for a particular cooking need—e.g. using a broiler is very energy intensive, and a griddle or convection oven can save energy—and best practices such as batching uses and avoiding leaving equipment on when not in use. A suggested maintenance schedule would help ensure that equipment is operating as designed.
- The lease document could include a clause requiring ENERGY STAR rated appliances where possible or include other energy efficiency requirements (as not all categories of kitchen equipment have ENERGY STAR standards).
- Facility management should pursue partnerships with appliance manufacturers for donated or low cost energy efficient equipment. As the Hatchery is a nonprofit working to promote entrepreneurship, manufacturers may be willing to donate equipment for charitable reasons. Additionally, the shared kitchen could be a proxy local showroom for manufactures. Also, the shared kitchen and some tenant kitchens could be testing venues for new equipment to give valuable real-world feedback to manufactures. Associations such as the North American Association of Food Equipment Manufacturers and National Restaurant Association may be good avenues into finding potential partners.

5. https://www.comed.com/WaysToSave/ForYourBusiness/Pages/CommercialKitchenEquipment.aspx
https://www.nicorgasrebates.com/your-business/rebates-for-your-business
http://www.peoplesgasdelivery.com/business/pdf/rebates_prescriptive.pdf

Cold Storage

The Hatchery is consolidating the bulk of cold storage to one part of the building—tenants will be able to rent a secure, locked share of the space. This allows tenants with variable inventory needs to adjust their cold storage accordingly and creates efficiencies in space and energy use that individual walk-ins would not provide. Flexible space also allows producers to buy in bulk, reducing costs, and potentially reducing the truck traffic to the building since shipping and storage are interrelated. The building's high ceilings will allow longer-term storage of bulk goods up high in the cold storage area. Some of the individual kitchens will choose to still have reach-ins for the daily supply of ingredients, and the large shared kitchen may have a larger cold storage unit.

Photo: Tim McFarlane, Flickr/Creative Commons

COLD STORAGE RECOMMENDATIONS

- Right-sizing cold storage is extremely important to a food facility's energy profile. The flexible shared solution at the hatchery can be a great way to avoid installing too much capacity.
- ENERGY STAR equipment with efficient motors should be used. The space should be well-insulated and have LED lighting that gives off less heat.
- The cold storage access points should be designed to keep cold air in and warm air out to the maximum extent possible. Solutions for this include a vestibule, door closers, and insulating curtains. In addition, placing large carts near cold storage will allow users to make the fewest possible trips in and out.
- Breaking the space up into insulated cubes, so that when one part is accessed the rest stays sealed will reduce the impacts of access points.
- Refrigeration systems generate a significant amount of waste heat that can be repurposed. Hot water is one application for this in a food manufacturing environment, but the piping for such a set-up may be expensive in the Hatchery because the cold storage is far from hot water uses.
- As with all of the appliance and building energy systems, regular maintenance will ensure that the cold storage equipment is running properly and keeping food at optimal temperature.

Water

Food manufacturers use a lot of water and particularly hot water. Addressing both water usage and efficient water heating will cut long-term costs. At the Hatchery, the water is supplied to pods of 8 kitchens. The scale of the shared systems provides opportunities for efficiencies. Saving water, whether hot or cold, has systemic benefits for the entire community's environmental footprint and the cost to run utilities in the city, because the energy required to pump and treat water is significant.

WATER RECOMMENDATIONS

- Solar-thermal hot water systems make use of free energy from the sun and are very cost-competitive, proven technologies. Solar thermal would be a good solution for the Hatchery, but would need to be paired with electric or gas water heaters as boosters to meet high-heat needs, for times of high water use, or when there is low availability of solar thermal energy.
- On-demand or tankless water heating systems have come a long way and should be carefully compared against standard water heaters for lifecycle costs. Sizing for an on-demand system must include consideration for dishwashers or any other equipment that has a need for a high water flow rate and large uses, such as filling a big sink with hot water. A well-operating system will also ensure that tenants do not have to run water while waiting for it to get hot.
- Ensuring that the tenants are purchasing efficient water-using equipment, most importantly dishwashers, is essential. Some dishwashers now heat their own water on-demand, which could be a good match with a solar thermal system. Lower-heat systems combined with sanitizing chemicals can cut hot water needs.
- Tenants should be given information about other water saving measures, such as high-efficiency pre-rinse spray valves with auto-shutoffs.
- On-site water reuse is becoming increasingly common for facilities of all types, including food manufacturers. Non-potable water from uses like dishwashing can be re-used to flush toilets using a separate set of pipes. Watering landscaping is another popular reuse, but the Hatchery will not have greenspace on site. Large-scale food manufactures may find that modern on-site treatment and reuse systems are cost effective given wastewater costs and regulations.
- The Hatchery site is nearly 4 acres, so stormwater management is required. An underground tank storage system is planned, but catching the rain that falls on the facility for non-potable use, or if there were space, a green roof that uses rainfall to grow herbs, greens, and other vegetable would be sustainable solutions for the site.

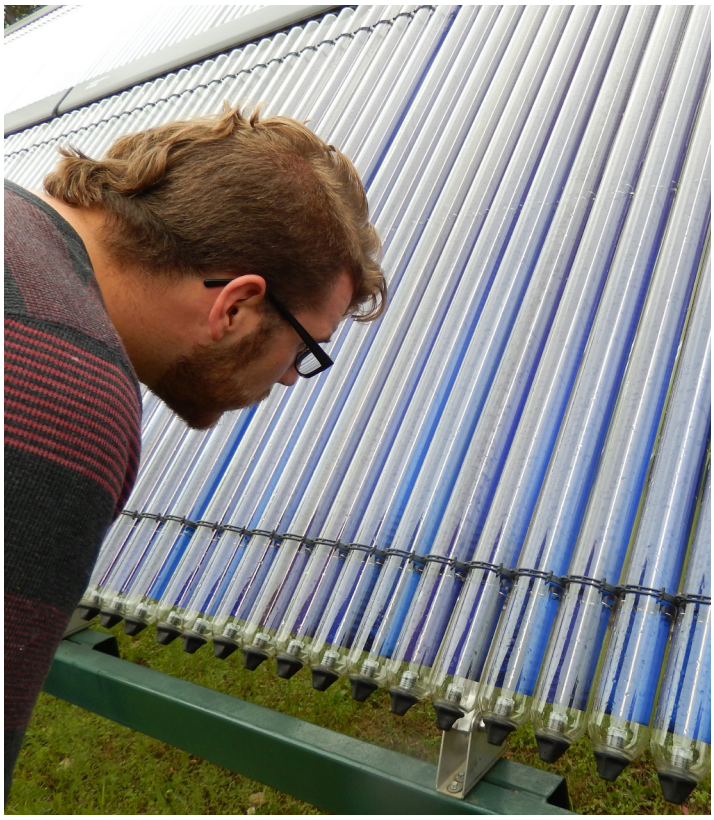


Photo: Clean Energy Resource Team, Flickr/Creative Commons

Lighting

Lighting is a relatively small share of overall energy use in kitchens, but lighting savings create twofold energy benefits, because inefficient lighting gives off heat and creates space conditioning needs. Lighting technology has improved dramatically in the past several decades and new efficient lights use just a fraction of the energy of incandescents and first generation fluorescents, especially when combined with tools such as daylighting, occupancy sensors, and dimmers.

As initially designed, the Hatchery will include daylighting in office and common areas as described in the Building Envelope section of this document, as well as standard lay-ins with occupancy sensors in the kitchens where a light level of 30 foot candles is required for safety.

LIGHTING RECOMMENDATIONS

- Task lighting at 5 feet can provide light where it needs to be and can help reduce demand overall. If there are only one or two places where you need a high level of light, there is no need to illuminate the whole space to that ambient level. Task lighting can be combined with specific pieces of equipment to create overall process efficiency, although many manufacturers do not yet provide this.
- Dimming LEDs does not save much energy, but occupancy sensors and timers are essential to ensuring that lights do not stay on when they are not needed.
- As discussed in the building envelope section, tubular skylights or solar tubes are a particular type of daylighting that mimic recessed can lights and work in a variety of applications. The Hatchery should determine whether the other roof space needs and ventilation issues associated with the kitchens make these appropriate for the space.

Other Sustainability Issues

While the primary focus of this consultation has been energy and water, considering the full environmental footprint of the facility and its contribution to sustainability and resiliency in the community and broader food system will attract tenants and clients, as well as bring multiple benefits to all stakeholders.

OTHER SUSTAINABILITY RECOMMENDATIONS

- Training for tenants should go beyond energy and water into the other elements of the kitchen's sustainability footprint. A waste stream audit up front that includes education on proper fats/oil/grease disposal will help the facility stay in regulatory compliance. A partnership with a biofuel producer to reuse or recycle waste oil could cut costs as well.
- Food waste strategies, such as composting or on-site anaerobic digestion could be the next step to lowering costs.
- Helping tenants think through options to reduce shipping needs will benefit the bottom line and reduce transportation demand.
- Giving tenants access to and information about transportation alternatives for employees will help lower costs for the employees and reduce parking demand. Secure bike storage and screens in the common area showing transit arrival times can make alternatives to driving more attractive. The education for tenants should include information on pre-tax transit checks, which can save both employer and employees money.
- As tenants prepare to graduate, providing information on available facility locations near transit can help them attract workers and reduce costs for employees.
- Equity is an essential part of sustainability and by supporting entrepreneurs from underrepresented communities food manufacturing incubators are contributing to the reduction of inequality. A partnership with a quality, affordable childcare option nearby, for example, would support the success of entrepreneurs and their employees.

People

While not a standard building system, the people who occupy the Hatchery will be among the biggest determiners of its energy footprint, so systems and innovations to inform and shape their energy use decisions are essential.

- The most cost effective and longest lasting approach will be training. Making sure tenants know not to override a thermostat because of a temporary need, or understand the importance of proper equipment maintenance, for example. Giving tenants great basic energy efficiency training for food service will allow them to take that knowledge with them as they move forward to their full-scale businesses, turning "best practice" into standard practice.
- Nobody in the food industry has the time to be an energy expert, so information needs to be strategically targeted and granular. Information should be available when it is needed—appliance efficiency training provided before appliance purchase decisions are made; cleaning, startup and shutdown best practices learned as habits are being formed; seasonal maintenance reminders, or operations improvements suggested as processes are being refined. Actionable strategies broken down into manageable chunks, such as "4 things you can do this week," are much more likely to be put into effect right away than a long workshop or thick handbook.
- The flow of information should go both ways. Feedback from the entrepreneurs about what is working and what is stifling their day-to-day operations will help everyone and can improve systems and education for the next set of tenants. A two-way conversation is also a sign of true engagement and a culture of sustainability and efficiency in the facility.
- Feedback is essential to motivating behavior change. Submetering each piece of equipment and providing real-time usage data would be ideal, but may not yet be practical with current technology. Even if the most fine-grained set of data available is only at the multi-kitchen pod level, posting a report of the energy use of every pod in a common area on a frequent basis would allow tenants to identify spikes and see if a piece of equipment was left on and learn from their peers on how to save energy. Basic fault detection for equipment is essential to avoiding surprises on energy bills.

Photo: Fernando de Sousa, Flickr/Creative Commons

- Feedback mechanisms in the facility may be the best selling point for getting donations of advanced equipment. It may be possible to sell the facility as a "laboratory" where appliance manufacturers can deploy equipment for real-world testing. Individual tenants could agree to occupy test kitchens in exchange for free or reduced appliance costs, or the common shared kitchen could be set up in this way.
- An occasional checkup of a kitchen's equipment and processes by an expert could catch mistakes early and identify maintenance needs.
- If a full-time energy manager is not viable for the site, there may be a potential role for a student intern or energy fellow to work part-time on the site tracking and reporting energy use, developing curriculum, and working with tenants.

Conclusion

Small businesses are a vital source of jobs and economic growth and incubators like the Hatchery are proven ways to support entrepreneurs as they build successful and sustainable organizations. The high energy use intensity of food manufacturing makes it an important area for energy efficiency innovation to drive down costs and reduce the environmental impact of our food system. Starting new entrepreneurs off with strong energy education and supportive systems that bake efficiency into operations will pay dividends later as the businesses grow and employees branch off into other endeavors. Thinking beyond energy and water will help a food manufacturing incubator improve the efficiency of all of its tenants' processes.

Food production is an area that will continue to benefit from energy efficiency innovation in years to come. New technologies and processes will help reduce energy intensity, but the change must be driven from all parts of the industry—food manufacturers must be empowered with the knowledge to drive demand for lower energy use equipment, appliance manufacturers must continue to adopt the latest research and development into their products, and facilities must be designed to support sustainability. An efficient, modular facility with low energy costs that allows for flexibility as tenants change should be turn-key rather than the exception. Over time, cutting energy costs will help grow sustainable food production in our neighborhoods providing much needed employment and improving the resiliency of our communities.

APPENDICES

More Information

Provided below is a list of references and organizations to find more information about commercial kitchen efficiency. The energy efficiency world is changing rapidly and new innovations are coming along all of the time, so be sure to check the age of any information you use.

LOCAL UTILITY INCENTIVE PROGRAMS

- Commonwealth Edison (ComEd) Commercial Kitchen Equipment Incentives: https://www.comed.com/WaysToSave/ForYourBusiness/Pages/CommercialKitchenEquipment.aspx
- Peoples Gas http://www.peoplesgasdelivery.com/business/pdf/rebates_prescriptive.pdf
- Nicor Gas https://www.nicorgasrebates.com/your-business/rebates-for-your-business

PACIFIC GAS & ELECTRIC (PG&E) FOOD SERVICE TECHNOLOGY CENTER

https://www.pge.com/en_US/business/services/training/training-centers/food-service-technology-center/food-service-technology-center.page

- Ventilation Design Guide: http://www.fishnick.com/ventilation/designguides/
- Water Heating Design Guide: http://www.fishnick.com/design/waterheating/

ENERGY STAR PORTFOLIO MANAGER

https://www.energystar.gov/buildings/facility-owners-and-managers/existing-buildings/use-portfolio-manager

ENERGY STAR INFORMATION FOR RESTAURANTS

- Rebate Finder: https://www.energystar.gov/rebate-finder
- Overview: https://www.energystar.gov/buildings/facility-owners-and-managers/small-biz/restaurants
- Fact Sheet: https://www.energystar.gov/sites/default/files/buildings/tools/restaurant_factsheet.pdf
- Energy Guide: https://www.energystar.gov/ia/business/small_business/restaurants_guide.pdf

U.S. EPA WATER SENSE INFORMATION FOR RESTAURANTS

- Overview: https://www3.epa.gov/watersense/commercial/types.html#tabs-restaurants
- Fact Sheet: https://www3.epa.gov/watersense/commercial/docs/factsheets/restaurants_fact_sheet_508.pdf

GREEN RESTAURANT ASSOCIATION:

http://www.dinegreen.com/

NATIONAL RESTAURANT ASSOCIATION CONSERVE PROGRAM

http://conserve.restaurant.org/

U.S. GREEN BUILDING COUNCIL'S (USGBC) LEADERSHIP IN ENERGY AND ENVIRONMENTAL DESIGN (LEED) COMMERCIAL KITCHEN MEASURES

http://www.usgbc.org/node/4335155?return=/credits

Workshop Attendees and Advisors

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- Donald R. Fisher, P.E., President, Fisher Consultants
- Hannah Jones, Director of Economic Development, Industrial Council of Nearwest Chicago
- Jason Greenberg, Principal, AS Engineering, LLC
- Jeff Clark, Conserve Program Director, National Restaurant Association
- Jen McGraw, Director Sustainability Innovation, Center for Neighborhood Technology
- Jim Mark, Sr. Vice President, Managing Director-Chicago, Wight & Company
- Jim Young, Managing Consultant, Navigant
- Matt Zolecki, Senior Project Manager, Wight & Company
- Michael Wartan , Sales and Operations in The Food Service Industry, Gator Chef
- Rich Wallach, Senior Director of Community Development, IFF
- Richard Shandross, Associate Director, Navigant
- Robin Lee Greiner, Chief Operating Office, Accion Chicago
- Scott Bernstein, Founder and Chief Strategy + Innovation Officer, Center for Neighborhood Technology
- Stephen Dillon, Project Designer, Wight & Company
- Steve DeBretto, Executive Director, Industrial Council of Nearwest Chicago
- Steve Perkins, Vice President, Market Research + Innovation, Center for Neighborhood Technology
- Suneet Lad, Director, Incubator Development, Accion Chicago

ABOUT CNT

CNT aims to streamline and accelerate the adoption of cutting-edge EcoDistrict approaches to adopting green resources and facilitating sustainable economic development in Chicago.

As an award-winning innovations laboratory for urban sustainability, the Center for Neighborhood Technology (CNT) is dedicated to taking on big challenges, starting in small places. CNT helps make neighborhoods, cities, and regions work better, for everyone.

Visit ***www.cnt.org*** for more information.

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CNT 773 278 4800 info@cnt.org