Treasure Map FOR **LABORATORIES**

Grab a clipboard and take this map along on your treasure hunt. Focus on uncovering opportunities to save. When you find something, make notes about location; tools, materials, or expertise needed; or further research required. Feel free to add to or modify this list to suit your own needs.

Facility Name _____ Floor _____ Date _____ Team _____

1 Facility Management

- ❑ Make note of your EUI and ENERGY STAR Score in Portfolio Manager.
- ❑ Ensure that facility energy management plan and operations & maintenance plan is up to date and that appropriate staff have reviewed the latest versions.
- ❑ Review building management system (BMS) and/or building automation system (BAS) code to ensure that specific commands to reduce unneeded energy consumption (e.g., on/off times) have not been overwritten.
- ❑ Consider daytime cleaning to reduce the hours the space is occupied. This allows for more aggressive "unoccupied mode" scheduling for lighting and HVAC.

2 Lighting

- ❑ Identify where lights have been left on in unoccupied spaces.
- ❑ Identify and assess opportunities to use automated lighting controls:
  - ❑ Occupancy/motion sensors for low-traffic areas.
  - ❑ Timers or daylight sensors to dim or turn off exterior and parking lot lights during the day.
  - ❑ Dimming controls in locations where there is natural lighting (e.g., near windows, skylights, light tubes).
- ❑ Confirm that installed lighting controls are operating as intended.
- ❑ Assess need to institute a regular cleaning plan for lamps/fixtures for maximum light output.
- ❑ Identify where reflectors can be practically added to existing lighting.
- ❑ Assess whether any areas are over-lit, compared to requirements or design levels; consider opportunities for de-lamping.
- ❑ Identify and de-energize and/or remove ballasts that are not in use.

NOTES:

- ❑ Evaluate the opportunity to upgrade to more energy-efficient lighting options:
  - ❑ Replace T12 fluorescents with T8s or T5s with electronic (rather than magnetic) ballasts; consider the use of tubular LEDs (TLEDs).
  - ❑ Upgrade incandescent and CFL applications to LED (especially for task lighting or specialty applications).
  - ❑ Use LED Exit signs in place of incandescent or CFL models.

3 Building Envelope

- ❑ Inspect doors and windows to identify gaps or cracks that can be repaired.
  - ❑ Note damaged or missing weather stripping.
- ❑ Note air leaks that should be sealed with caulking or other sealant.
- ❑ Inspect insulation levels and identify inadequacies to be addressed.
- ❑ Assess the opportunity to install solar film or other window coverings on east, west, or south exposures to reduce solar heat gain and heat loss.
- ❑ Assess the opportunity to install a reflective ("cool") roof covering in warm climates.

4 Lab Equipment

- ❑ Ensure that lab equipment is turned off when there is no justification for leaving it powered on (e.g., overnight; when not in use during operating hours). This includes:
  - ❑ Stir plates
  - ❑ Warmers
  - ❑ Water baths
  - ❑ Centrifuges
  - ❑ LED displays on equipment (if there is a separate display power switch)
  - ❑ Drying/vacuum ovens
  - ❑ Other large-scale equipment
- ❑ Ensure that fume hoods/VEEs/biosafety cabinets are closed and lights are turned off when not in use.
- ❑ If constant air volume (CAV) hoods are being used, evaluate opportunities to move to variable air volume (VAV) systems.

NOTES:

- ❑ Evaluate the use of the lab to determine if there is an opportunity to use low-flow fume hoods.
- ❑ Evaluate reducing fume hood face velocity.*
- ❑ Evaluate whether biosafety cabinets or other options could replace some fume hoods.
- ❑ Evaluate opportunities for demand-controlled ventilation.
- ❑ Assess plans for regularly cleaning refrigerator and freezer coils, and keep free of obstructions.
- ❑ Identify worn and/or leaky door seals/gaskets on lab refrigerators and freezers.
- ❑ Inspect freezer locations to ensure they are not in warm spots.
- ❑ Determine whether materials stored in freezers can be consolidated to reduce the total number of freezers required.
- ❑ Identify and assess opportunities to use ENERGY STAR certified laboratory-grade refrigerators and freezers.
- ❑ Consider implementing fault detection and diagnostics for ultra-low temperature freezers (ULFs) to ensure doors are not left ajar for prolonged periods.
- ❑ Consider "chilling-up" ULFs to -70°C from -80°C to save 30-40% on energy and prolong freezer lifespan. Most samples are safe at -70°C.
- ❑ Identify duplicate energy-intensive research equipment. Consider a laboratory equipment sharing program for potential efficiency gains.

*Reductions of fume hood face velocity should be in accordance with ANSI/AIHA Z9.5 containment levels and ANSI-ASHRAE 110 tracer gas testing.

Other Equipment/Plug Loads

- ❑ Identify any new office equipment or other products (e.g., refrigerators, water coolers) that will be needed soon; make plan to ensure they are ENERGY STAR certified where possible.
- ❑ Identify any equipment left on overnight (including those left in sleep/idle or screen saver mode).
- ❑ Ensure that power management settings are activated on office equipment such as computers, monitors, printers, and copiers.
- ❑ Ensure that any large-screen TV monitors are turned off during unoccupied times.
- ❑ Ensure that networked printers are being used, rather than personal printers in offices or workstations.

NOTES:

- ❑ Identify and discontinue the use of personal heaters and fans in offices or workstations (the use of such personal devices may indicate broader hot/cold issues that should be addressed at the system level).
- ❑ Identify where power strips can be used for easy disconnect from power source. Consider the use of advanced power strips.
- ❑ Identify any rechargeable devices left plugged in when fully charged; make plan to educate staff about unplugging fully charged devices.
- ❑ Check if vending machines get turned off or put in sleep mode at the end of the day. Consider installing motion/occupancy-based vending machine controls.
- ❑ Look for opportunities to replace older vending machines with new ENERGY STAR certified vending machines.

6 HVAC

- ❑ Identify and make plans to address instances of simultaneous heating and cooling.
- ❑ Ensure that thermostats and outside air temperature sensors are properly calibrated/maintained.
- ❑ Ensure that thermostats are set to appropriate temperatures based on season and local weather conditions.
- ❑ Ensure that thermostats are properly located to be representative of the room or zone for which the temperature is being controlled.
- ❑ Ensure that electronics are located away from thermostats.
- ❑ Identify where locking covers for thermostats and ventilation controls can be installed to prevent unauthorized adjustments.
- ❑ Confirm implementation of a temperature setback policy for heating/cooling when the building is unoccupied.
- ❑ Perform testing and balancing of air and water systems.
- ❑ Ensure free airflow to and from registers.
- ❑ Monitor make-up air ventilation and ensure the proper functioning of dampers to achieve outside air requirements.

NOTES:

- ❑ Ensure that HVAC system components are being maintained regularly, including:
  - ❑ Replace filters on a regular schedule.
  - ❑ Inspect and clean evaporator and condenser coils.
  - ❑ Clean fan blades and adjust belts as needed.
  - ❑ Inspect water/steam pipes and ducts for leaks and/or inadequate insulation; address as needed.
  - ❑ Verify and calibrate operation of variable air volume (VAV) boxes, where applicable.
  - ❑ Evaluate furnace/boiler efficiency and clean/tune up as needed (including boiler water treatment and inspection of steam traps, as appropriate).
  - ❑ Check chiller and cooling tower components for fouling or corrosion; ensure proper water treatment is in place.
  - ❑ Check for unusual noise, vibration and/or decrease in performance of compressors/motors.
- ❑ Determine whether air change rates in laboratory spaces can be reduced (e.g., 4-6 ACH occupied and 2-4 ACH unoccupied).
  - ❑ Conduct a laboratory ventilation risk assessment to determine the appropriate ventilation rate for each lab space occupied and unoccupied.
- ❑ Assess exhaust stack height and discharge velocity to minimize exhaust fan energy use.
  - ❑ Investigate whether exhaust system airflow rates can be reduced.**
- ❑ Evaluate whether chilled water demand loads can be reduced.
- ❑ Evaluate how the system operates during the cold months and assess opportunities to shut off a chiller or a pump.
- ❑ Where applicable, optimize the number and sequence of boilers/chillers working to keep them as close as possible to nominal load and optimum system efficiency.
- ❑ Look for opportunities to recover heat from boiler flue gases to preheat water.
- ❑ Assess the opportunity to install economizers on boilers.
- ❑ Identify and assess opportunities for installing variable frequency drives (VFDs) for fan and pump motors, and variable air volume (VAV) boxes in the ductwork – especially where variable loads are being served.
- ❑ Identify and assess opportunities to use occupancy sensors to control HVAC in personal offices or conference rooms.

**Changing exhaust system airflow rates may require wind tunnel modeling of exhaust dispersion for specifying acceptable exhaust/intake designs. See http://www.i2sl.org/documents/toolkit/bp_modeling_508.pdf.

NOTES:

ADDITIONAL NOTES: