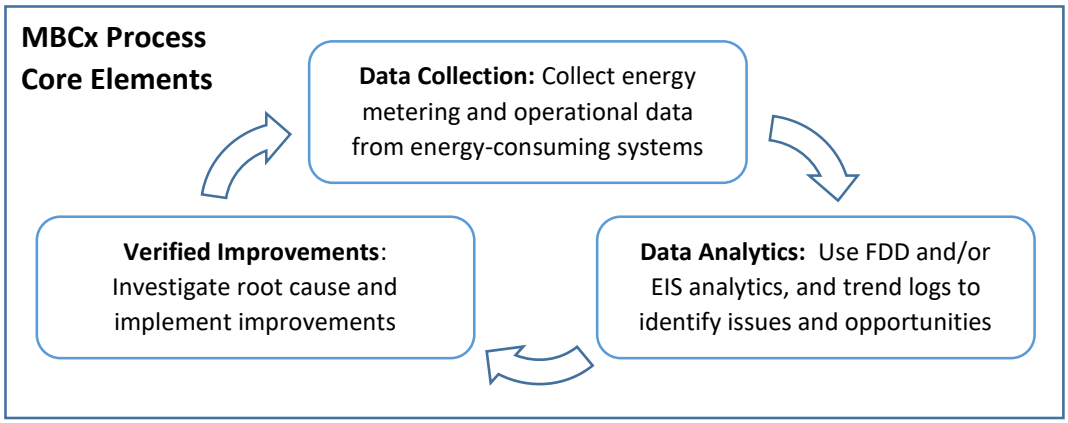
What you need to know about MBCx

What is monitoring-based commissioning (MBCx)?
Monitoring-based commissioning (MBCx) is a way to to maintain and continuously improve building performance over time. MBCx can reduce building energy waste up to 15%, improve occupant comfort, and extend mechanical equipment life, by identifying and implementing low cost operational improvements. Through the MBCx process operators get to know their building systems on a continuous basis using energy and performance data. The process is usually focused on HVAC and lighting system performance but can also be applied to other systems.

MBCx may be used during and after an existing building commissioning (EBCx) project to be sure that energy savings last, and to look for additional opportunities. The tools that support MBCx include fault detection & diagnostics (FDD), energy information systems (EIS), and building automation system (BAS) trend logs – these tools are types of energy management and information systems, or EMIS. The graphic below illustrates the three main elements of MBCx, showing how tools like FDD and EIS are incorporated into MBCx.



What are the benefits of MBCx?
Existing Building Commissioning (EBCx) is a proven strategy to cut energy waste by 5-15%, and operators should repeat the EBCx process every 3-5 years to rectify performance degradation that happens over time. MBCx can prevent that performance degradation, and offers two major benefits:

- Analytics software rapidly analyzes thousands of HVAC system components, enabling identification of deeper savings opportunities in a way that isn't cost-effective with manual analysis;
- When system performance drifts from optimal, analytics software catches the issues so they can be resolved before turning into problems that impact occupant comfort.

How do I implement an MBCx process?
MBCx may be managed completely in-house or with outside support. The table below illustrates options for implementing the three core elements of MBCx.

Analytics	• Use software from a vendor; **or** • Develop own EMIS by programming FDD rules and adding metering into BAS
Stay on top of your data	• In-house review of analytics software dashboard, KPIS & reports; **or** • EMIS service provider remote analysis; **or** • Third party commissioning authority (onsite and/or remote)
Fix issues & verify performance	• In-house team implement fix and verify performance improvement(s); **or** • MBCx service provider implements and verifies performance improvement

METER-LEVEL ANALYTICS		
Checkpoint	**EMIS View**	**What to look for**
Schedules	Use heat map and/or load profile graphs with filtering for weekday/weekend/holiday	Confirm that time-of-day schedules meet the current facility requirements. Check weekends and holidays for scheduling improvement opportunities.
Baseload	Use heat map and/or load profile graphs with filtering for weekday/weekend/holiday	Compare to the peak load to assess the after-hour setback.
Energy signature	Hourly energy consumption vs. hourly outside air temperature (or daily energy consumption vs. degree days). Some EMIS automatically compare the energy signature metrics to industry benchmarks.	Weather-dependency of loads, balance point temperature at which heating or cooling starts), and baseload; High heating energy use in summer may be associated with simultaneous heating and cooling.
Load shape	24-hour demand plot, min/max/avg by day type	Start time, stop time, weekend, and holiday scheduling
Energy Savings/M&V	The cumulative annual energy savings, or % change in energy use	Model statistics are within the thresholds set
FAULT DETECTION AND DIAGNOSTICS		
Faults	**FDD Tool Analysis**	
General Faults		
Schedules (air handling units, terminal units, chillers, boilers, pumps, cooling towers, plug and process loads, and garage exhaust fans)	Check if equipment is operating out of hours.	
Manual override (air handling units, terminal units, chillers, boilers, pumps, and cooling towers)	Identify overrides that should not be in place.	
Controllers (actuators/valves/speed drives)	Compare controller output setpoints to the actual condition to find failed devices. Determine the stability of controllers	

Excerpt of the Monitoring Action Plan, taken from LBNL's MBCx Plan Template

Where do I start?

Recognizing that MBCx is not yet an everyday practice, LBNL has developed an MBCx Plan template to guide the project planning phase. The MBCx Plan template is designed for use by building staff, e.g., an energy manager, and/or a third party such as a commissioning provider. Once created, the MBCx Plan drives a thorough, step-by-step MBCx process and helps all team members (internal and external) to be fully aware of the plan and their responsibilities.

The MBCx Plan template includes background information and key guidance, with more detailed material in the appendices, such as the Monitoring Action Plan (shown above). The template is built around best practice concepts identified by LBNL through interactions with real projects and providers, and it can be tailored to the unique needs and scope of each MBCx program.

Who is doing MBCx?

MBCx is becoming more popular as the availability and capabilities of analytics software increases. In May, 2017 the Smart Energy Analytics Campaign recognized five organizations for their success with MBCx / energy management and information systems (EMIS). For example, Salt Lake City's Public Safety Building used MBCx to address performance concerns, reduce energy waste by 35%, and achieve net zero carbon emissions. Case studies on Salt Lake City and the other four recognized organizations can be downloaded from the Smart Energy Analytics Campaign website.

The Smart Energy Analytics Campaign supports commercial building owners in applying best practices for the use of energy management and information systems (EMIS). The program provides technical assistance, recognition, and a chance to better understand product offerings and performance in a quickly changing technology space. **Learn more at smart-energy-analytics.org**