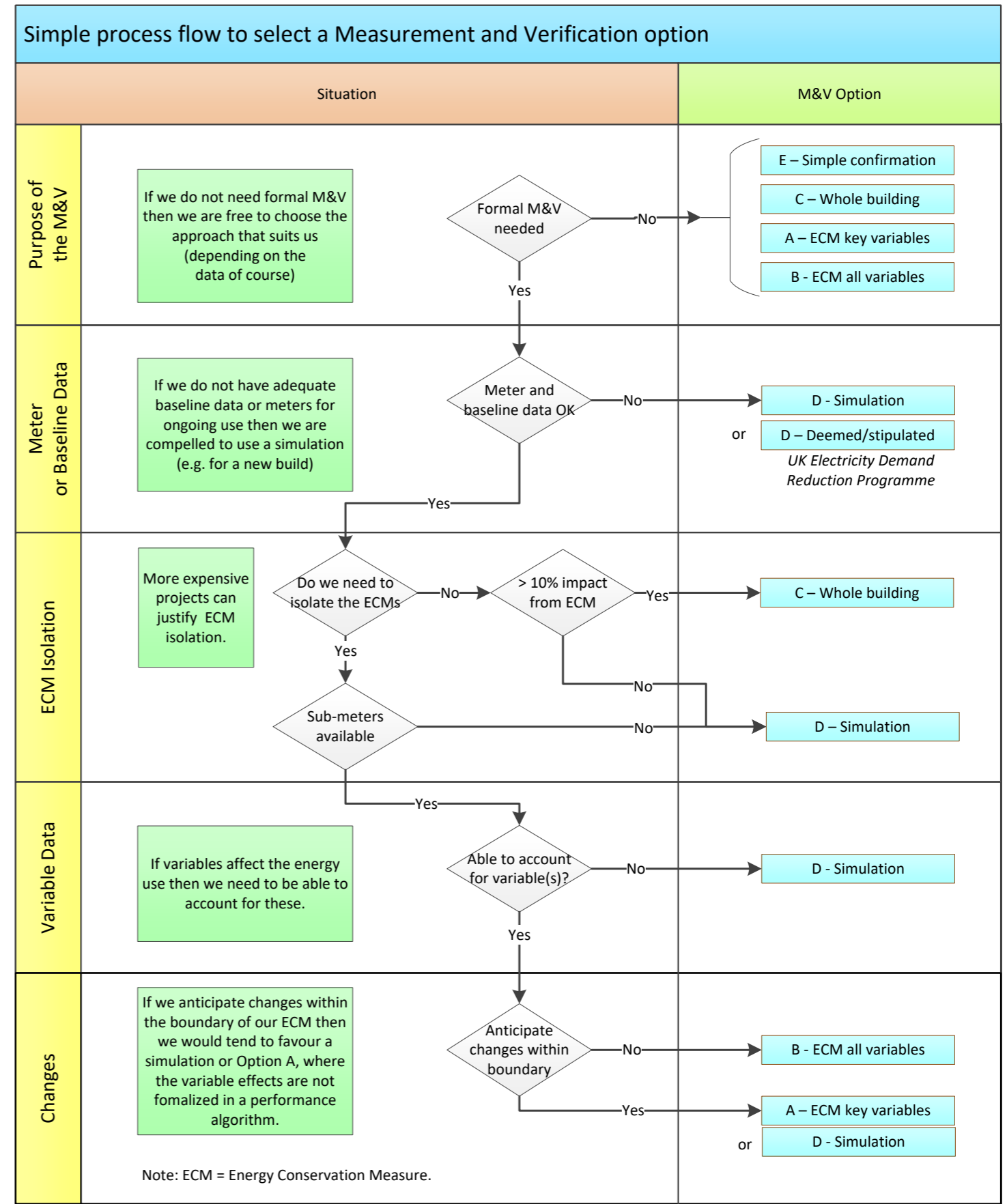


Measurement and Verification: Selecting the appropriate method

		ECM or Retrofit Isolation Approach		Whole Facility Approach	
Illustration					
Category		Option A	Option B	Option C	Option D
Name		Isolation with key parameter measurement	Isolation with all parameter measurement	Whole facility measurement	Calibrated computer simulation
Description		A combination of measured and estimated factors	All the key factors are measured	Measurement of the whole facility and regression with key variables	A computer simulation is used, and calibrated with actual energy use
Measurement Frequency		Short-term, periodic or continuous	Short-term, periodic or continuous	Continuous (needs a fairly long term baseline). > 9 data points	Use simulation data before/after or simulation before/actual use after
Example		Lighting, power is measured, hours of operation are estimated	Variable speed drive, where the power use is measured directly	Replacing a gas boiler using a heating degree days baseline	Major refurbishment of a building with many overlapping ECMs
Application & Limitation		Appropriate for simple ECMs	Appropriate for more complex ECMs	Rarely used in federal projects	Complex and needs engineering knowledge
Common choice for different situation	Need a focus on Individual ECMs	Yes	Yes		Yes
	Need to assess the whole site			Yes	Yes
	Savings expected to be <10%	Yes	Yes		Yes
	Baseline unavailable/new build				Yes
	Significance of variables not clear		Yes	Yes	Yes
	Changes within boundary possible	Yes			Yes
	Project interacts with others			Yes	Yes
	Understandable reports needed	Yes	Yes	Yes	
	Metering skills needed	Yes	Yes		
	Computer modelling skills needed				Yes
Standards	Regression skills needed			Yes	
	IPMVP ⁴⁰⁶	Yes	Yes	Yes	Yes
	FEMP M&V Guidelines v4.0 ²⁷⁷	Yes	Yes	Yes	Yes
	ASHRAE Guideline 14-2002 ³⁷	No	Yes	Prescriptive/performance	Yes
	UK ERD Pilot M&V Guide ²⁴²	Yes	Yes	Yes	Deemed
Investor Confidence Project ³⁸⁷	Yes	Yes	Yes	No	

Summary of Measurement and Verification options (above)
Adapted from FEMP v4.0²⁷⁷ and from IPMVP EVO 10000-1 2012⁴⁰⁵.



Simple flow-chart to select a Measurement and Verification Option
Includes "simple confirmation" where a formal method is not required.