Raising the Standard: Can International Standards help save Energy and Carbon?

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Can Standards help Save Energy?

To answer this, I will try and answer three related questions:

- What are (International) Standards?
- How do they cover energy use and carbon emissions?
- Do they actually lead to energy & carbon savings?

But first, I ought to say who I am…

Introduction – IBECCS Ltd

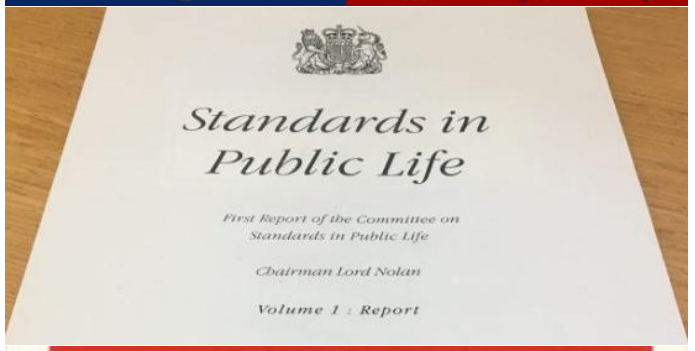
- Small consultancy in Milton Keynes, UK
- Ian Byrne, Principal
  - MA (Oxon) Mathematics, a long time ago
  - Chartered Accountant (FCA)
  - PhD Geography (20th Century Cartography)
  - ex-Deputy CEO, National Energy Foundation
- Over 35 years' experience in energy efficiency and low carbon, with focus on:
  - Energy and Carbon Consultancy Services
  - Practical advice for small & micro-organisations
  - International Standardisation

What are Standards?

"Standards" is an ambiguous word:

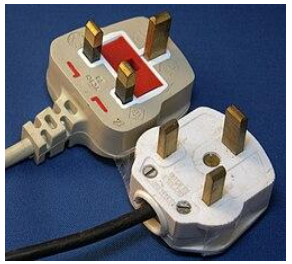
- Something to follow (a banner)
- Moral, ethical rules
- A marketing tool
- Minimum acceptable, or
- Average (a standard is not special), or
- Ambitious (something to be attained)?

- Or all the above?



What are standards?

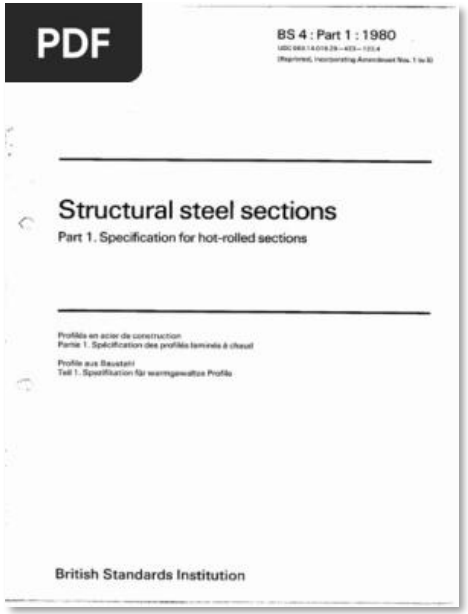
- National & international standards have elements of all the above
- Can define for interoperability
- Or set minimum requirements, including safety
- Or support management systems
- Or provide guidelines encouraging ambition

- Standards are always voluntary
  - Unless national governments enshrine them into law or other regulations
- And can be subject to verification (typically certification)

How did standards bodies develop?

- Early standards focused on basic industrial applications
  - e.g. BS1 rolled sections for structural purposes
- UK grew out of Engineering Standards Committee (1901)
- Became British Standards Institution in 1931
- In Germany, DIN standards began in 1917 as Normenausschuß der deutschen Industrie (NADI)
  - A1, A2, A3, A4... Paper sizes in DIN 476:1922
- International Electrotechnical Commission, 1906
- After WWII, ISO (International Organization for Standardization) established in Geneva for non-electrical standards



What is ISO?

ISO, the International Organization for Standardization:

- 175 members (one per country = national standards body, NSB)
- 829 Technical committees and subcommittees
  - 7,857 meetings in 20924, with 89% virtual
- 26,090 International Standards and other deliverables
  - Including 1,533 published in 2024
  - A total output of 1 266 579 pages in English and French
  - 4,363 work items being progressed
  - All created by volunteer “experts” representing NSBs
- Three goals in their 2030 strategy
- Climate change of increasing interest to ISO
  - All new standards have to consider its impact

How are standards written?

- **Consensus approach**
  - International experts from participating countries attend meetings and provide comments
  - Consensus = lack of sustained objection
- **Structured drafting process**
  - Working draft, to committee draft, draft international standard (available to public), FDIS, then International standard, each stage has a voting process: ''Yes'', ''No'' , or ''Abstain''
  - Typically takes 36 months
- **Requirements and other standards**
  - Guidance can become requirements if stating compliance
  - Other deliverables: TS, TR & PAS
- **Convenor is neutral**
  - Often convenor and project manager from two countries

Management system standards

Increasingly ISO has been involved in creating management system standards:

- ISO 9001, Quality management systems
  - Origins go back to British Standard BS 5750
- ISO 14001, Environmental management systems
- ISO 27001, Information security management systems
- ISO 45001, Occupational health and safety management systems
- ISO 50001, Energy management systems
- All utilize a common structure (known as Annex SL) and terms
- All based around PDCA: Plan-Do-Check-Act

ISO 50001: Energy Management

- Like other systems standards, ISO 50001 is built around around PDCA: Plan-Do-Check-Act
- Twin focus on energy use (how/what) and energy consumption (how much)
- Intended for use by wide range of organizations:
  - Industrial/Commercial
  - Public, private or non-profit

What elements are looked at?

Context of the organisation	Leadership	Resources
Energy review	Setting Energy Performance Indicators	Objectives, energy targets & action plans
Competence and awareness	Operations and maintenance (O&M)	Procurement and design
Communication & document control	Monitoring and measurement	Management review

Context

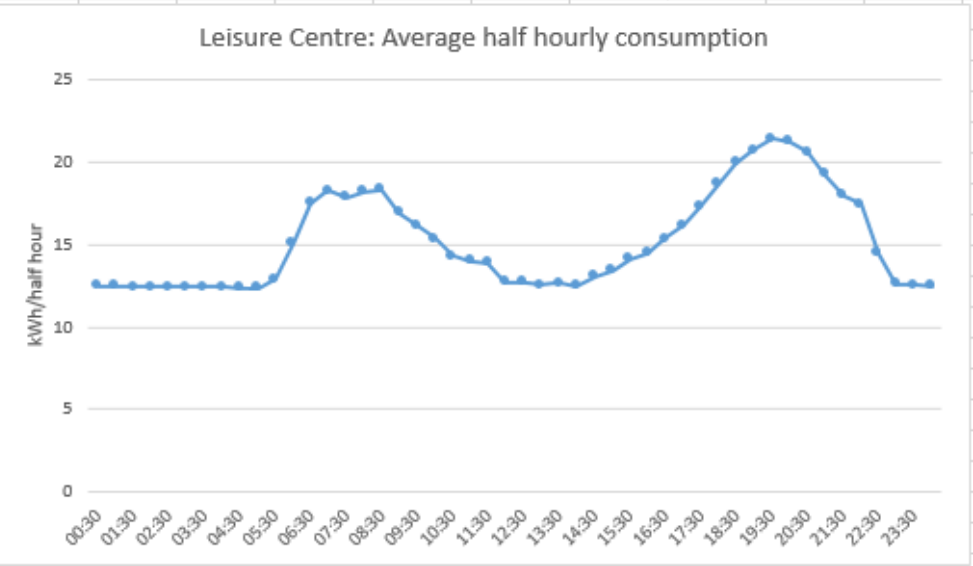
- What do we do?
- Where do we do it?
- Why are we doing this (drivers)?
- Who is making this happen?

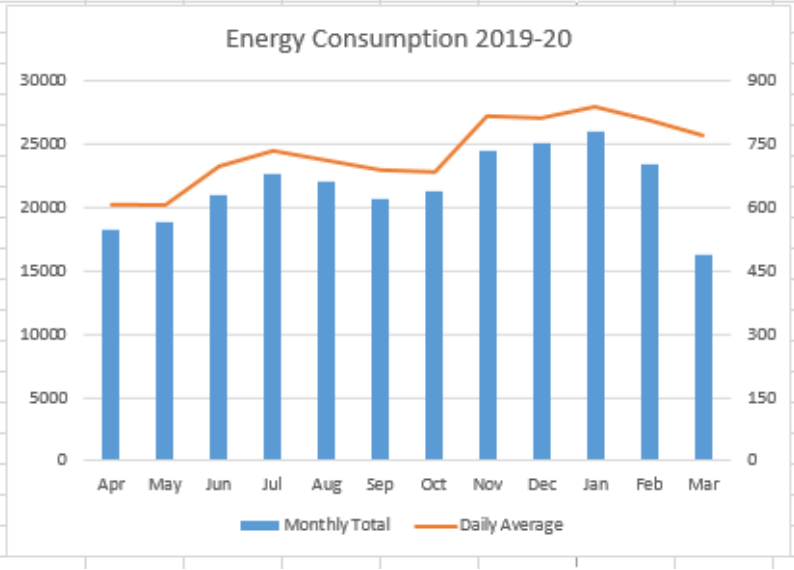
Resources

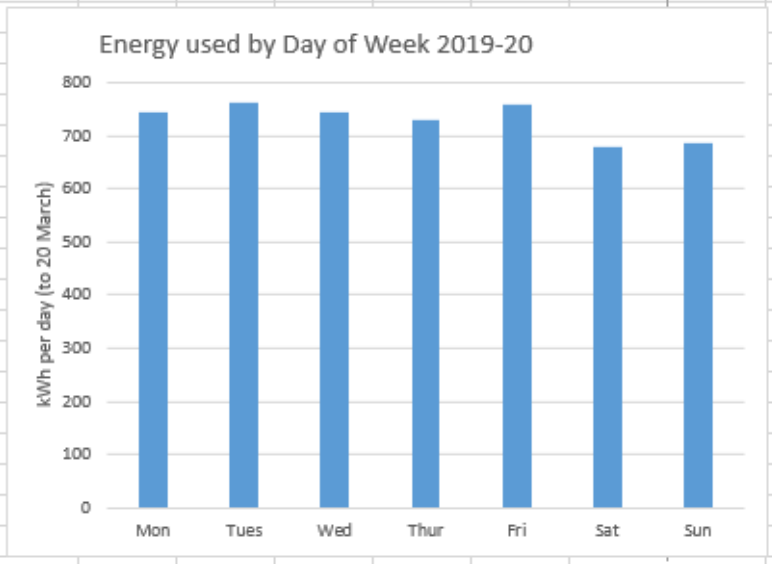
- Capital or revenue – good management may not cost money
  - Targeting behaviour change
- Can the organization afford capital upgrades?
  - Is it waiting for a grant?
  - What's the ROI? Can it estimate the expected savings?
  - The business case for reducing costs is sometime harder than for increasing sales
  - Will it also reduce CO_2 emissions?
- What about the human element?
  - Staff motivation (and rebound effect)
  - Skills & competencies

Energy Review

- Data is important – what's available?
- Paper bills…or half hourly data
- Completeness, accuracy
- Granularity

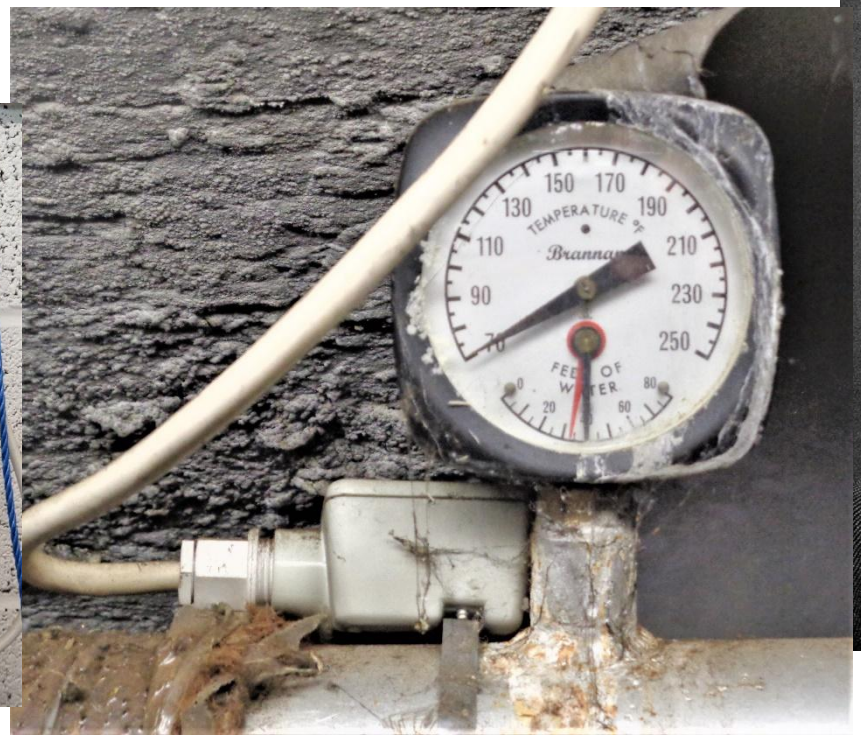






Measurement & Monitoring

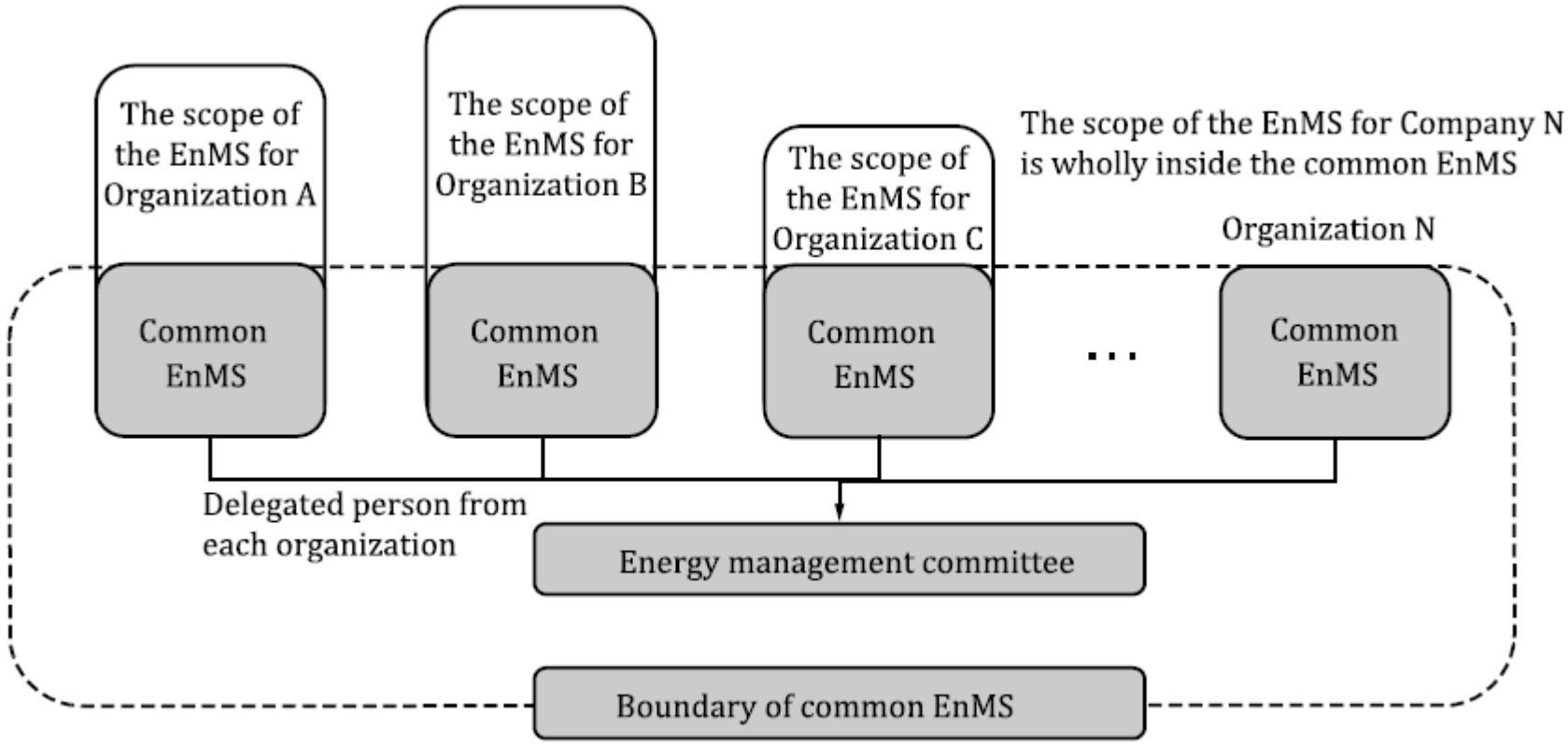
- If you don’t measure, you cannot manage
- Sub-metering is encouraged
- M&T systems



Not ready for 50001? Try 50005

- Smaller organizations with no experience of (say) ISO 9001 may find a full energy management system difficult to define & implement
- ISO 50005 seeks to provide a stepwise approach
- Four levels of maturity

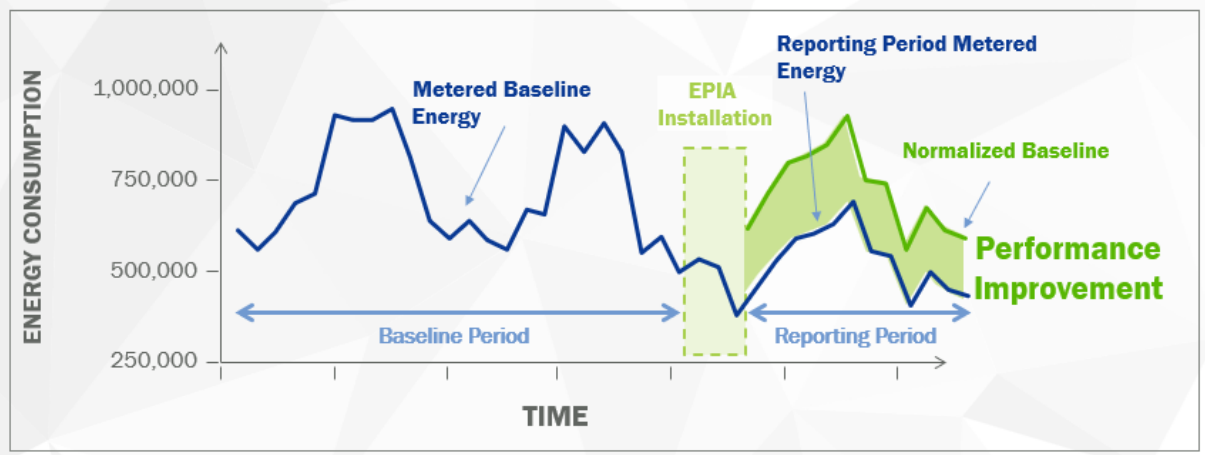
Working with supply chain? Use 50009

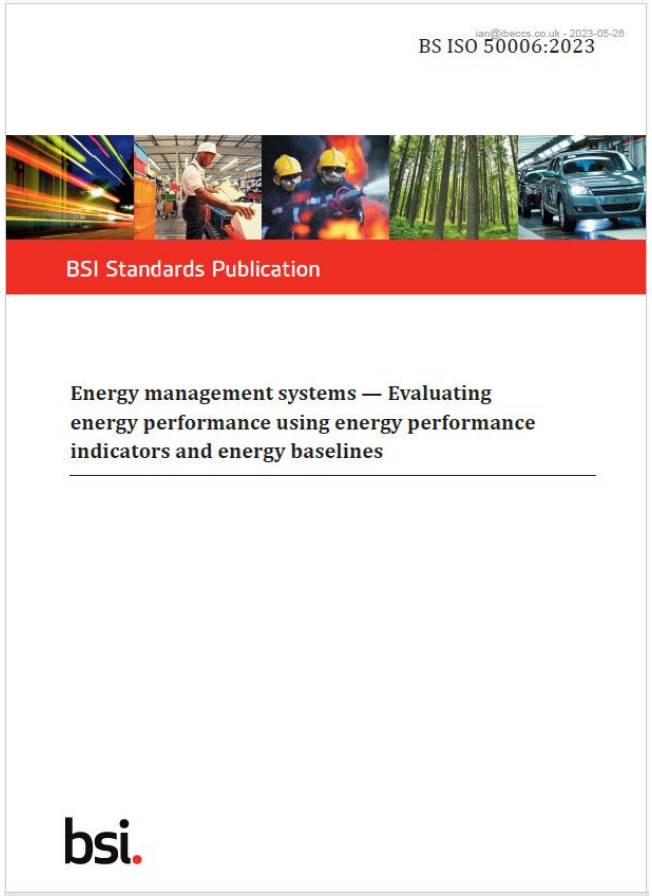


- Not only for supply chains, can work where there are multiple tenants of an industrial estate or shopping mall, or in a franchise system

Energy Performance Indicators: 50006

- Explains approach to establishing energy baselines and energy performance indicators (EnPIs)
- Considers data collection and data quality
- Creation of models relating energy consumption to relevant variables (activity indicators)
  - Statistical or engineering models
  - Initial conditions at baseline period
  - Some consideration of normalization of data





Determining Energy Savings: 50047

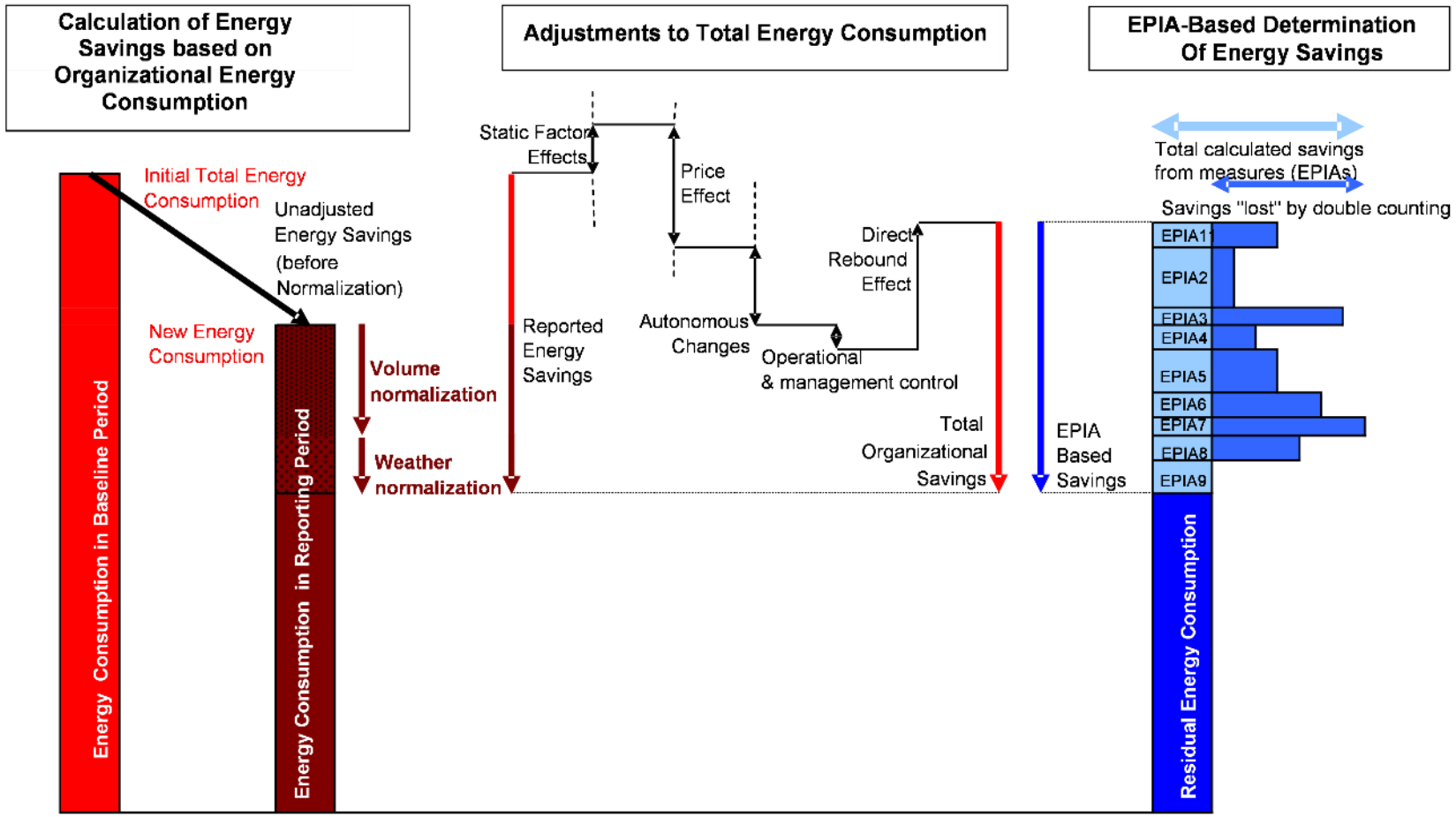
- Allows energy savings to be calculated by summing individual savings (bottom up) or at the organizational level (top down)

- Takes into account:
  - Measurement periods
  - Production volumes, activity levels, operating hours (relevant variables)
  - Weather effects, variable composition of raw materials (relevant variables)
  - One off changes like new buildings, purchase or sale of subsidiaries (static factors)
  - Changes in fuel used (energy accounting)
  - Interactive effects & double counting

Determining Energy Savings: 50047

- Detailed consideration of normalization
  - Baseline period, reporting period or reference conditions
- Also considers how to avoid double counting
- Accounting for unmetered supplies, such as some biomass, fuel switching, autonomous progress and rebound effects

Determining Energy Savings: 50047



And there are more…

- TC-301, the relevant committee, lists 22 published standards
  - Including technical reports and publicly accessible specifications
  - Some are to be withdrawn owing to low sales and lack of resources to update
- Work continues on new standards - ISO 50100 on decarbonization
- But TC-207/SC7 Greenhouse Gas & Climate Change Management has responsibility for carbon calculation and net zero standards

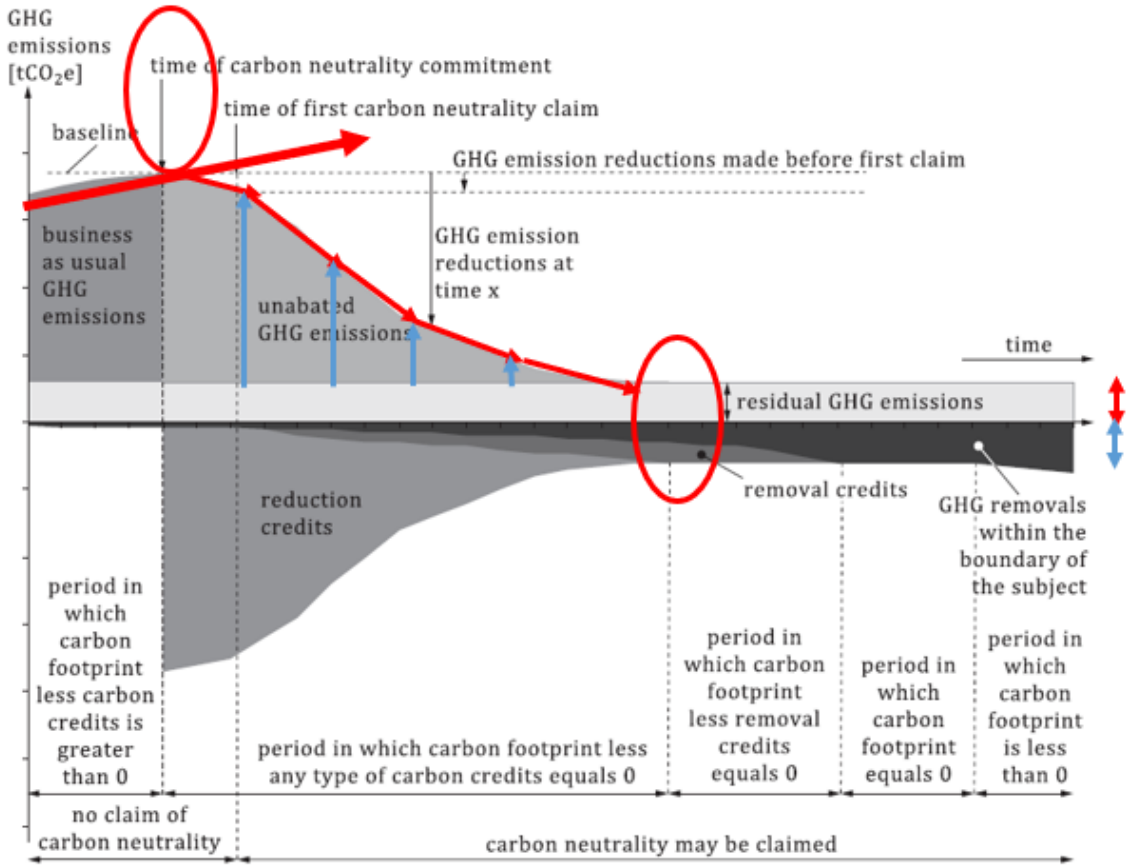
Standard and/or project under the direct responsibility of ISO/TC 301 Secretariat ↑
ISO/IEC 13273-1:2015 Energy efficiency and renewable energy sources — Common international terminology — Part 1: Energy efficiency
ISO/IEC 13273-2:2015 Energy efficiency and renewable energy sources — Common international terminology — Part 2: Renewable energy sources
ISO 17741:2016 General technical rules for measurement, calculation and verification of energy savings of projects
ISO 17742:2015 Energy efficiency and savings calculation for countries, regions and cities
ISO 17743:2016 Energy savings — Definition of a methodological framework applicable to calculation and reporting on energy savings
ISO 50001:2018 Energy management systems — Requirements with guidance for use
ISO 50001:2018/Amd 1:2024 Energy management systems — Requirements with guidance for use — Amendment 1: Climate action changes
ISO 50002-1:2025 Energy audits — Part 1: General requirements with guidance for use
ISO 50002-2:2025 Energy audits — Part 2: Guidance for conducting an energy audit using ISO 50002-1 in buildings
ISO 50002-3:2025 Energy audits — Part 3: Guidance for conducting an energy audit using ISO 50002-1 in processes
ISO 50003:2021 Energy management systems — Requirements for bodies providing audit and certification of energy management systems
ISO 50004:2020 Energy management systems — Guidance for the implementation, maintenance and improvement of an ISO 50001 energy management system
ISO 50005:2021 Energy management systems — Guidelines for a phased implementation
ISO 50006:2023 Energy management systems — Evaluating energy performance using energy performance indicators and energy baselines
ISO 50007:2017 Energy services — Guidelines for the assessment and improvement of the energy service to users
ISO 50008:2021 Energy management systems — Guidance for implementing a common energy management system in multiple organizations
ISO/PAS 50010:2023 Energy management and energy savings — Guidance for net zero energy in operations using an ISO 50001 energy management system
ISO/TS 50011:2023 Energy management systems — Assessing energy management using ISO 50001:2018
ISO 50015:2014 Energy management systems — Measurement and verification of energy performance of organizations — General principles and guidance
ISO/TS 50044:2019 Energy saving projects (EnSPs) — Guidelines for economic and financial evaluation
ISO 50046:2019 General methods for predicting energy savings
ISO 50047:2016 Energy savings — Determination of energy savings in organizations
ISO 50049:2020 Calculation methods for energy efficiency and energy consumption variations at country, region and city levels

Climate Change Mitigation Standards

- 17 published standards, including four on adaptation
- Key quantification standards include:
  - ISO 14064-1 Greenhouse gases — Part 1: Specification with guidance at the organization level for quantification and reporting of greenhouse gas emissions and removals
  - ISO 14064-2 Greenhouse gases — Part 2: Specification with guidance at the project level for quantification, monitoring and reporting of greenhouse gas emission reductions or removal enhancements
  - ISO 14067 Greenhouse gases — Carbon footprint of products — Requirements and guidelines for quantification
- These will in future be jointly developed with the GHG Protocol

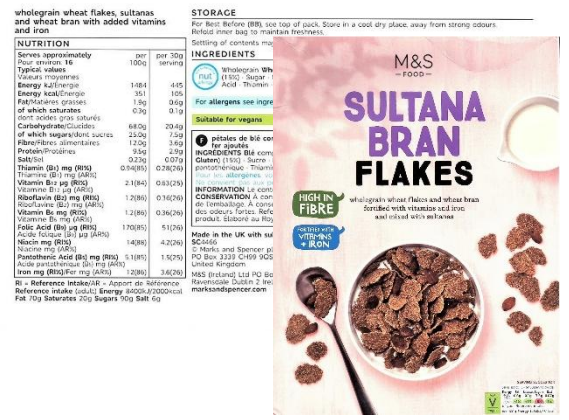
Carbon Neutrality and Net Zero

- ISO 14068-1 Carbon Neutrality requires:
  - A carbon neutrality management plan, with at least 1 year's implementation
  - Action begun to reduce emissions in line with the plan (see diagram)
  - Offsetting of unabated emissions using high quality carbon credits
- ISO 14060 Net Zero Aligned Organizations will require:
  - A net zero transition plan, broadly aligned with the Paris target of 1.5°
  - A commitment to wider action to combat climate change
  - Removals (including by carbon credits) of residual emissions at net zero



Carbon Neutrality and Net Zero

- ISO 14068-1 and ISO 14060 are both largely about claims
- Aim to reduce the “Wild West” with robust, verified claim



So do they lead to energy savings?

- Sales or downloads are through NSBs, not centrally, so data on take-up is patchy
  - Approaching 100,000 sites have an ISO 50001 certificate
  - Significantly lower numbers than for ISO 9001, ISO 14001 or ISO 45001
  - Sales of the other standards are relatively low, and sometimes concentrated in a single country
  - One barrier is cost: typically CHF177 or local equivalent
  - ISO 50005 has been made freely available in UK (up to 100,000 downloads)
  - High cost also leads to websites with unauthorised (illegal) copies
  - One copy may also be used by a consultant to work across many organizations
- Some jurisdictions have written ISO 50001 into legislation – e.g. in UK can use as an alternative to ESOS audits (subject to certain conditions)

But does this lead to energy savings?

- Having a (legal) copy of a standard will not by itself lead to energy savings – action is required
- Always hard to identify additionality – would X have implemented measure Y if it hadn't had an energy management system or used ISO 500xx?
- Surveys & case studies show standards can help save energy, but only for well-motivated organizations
- Standards do not offer a prescription of measures to take, but provide the framework under which the most cost-effective ones are implemented
- Maybe there's a PhD research topic here! 😀

Thank you – Any Questions?

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