Measurement Standards Laboratory of New Zealand

Metering Accuracy – An MSL Perspective

Keith Jones
Tom Stewart

30 April 2019

A business of CallaghanInnovation

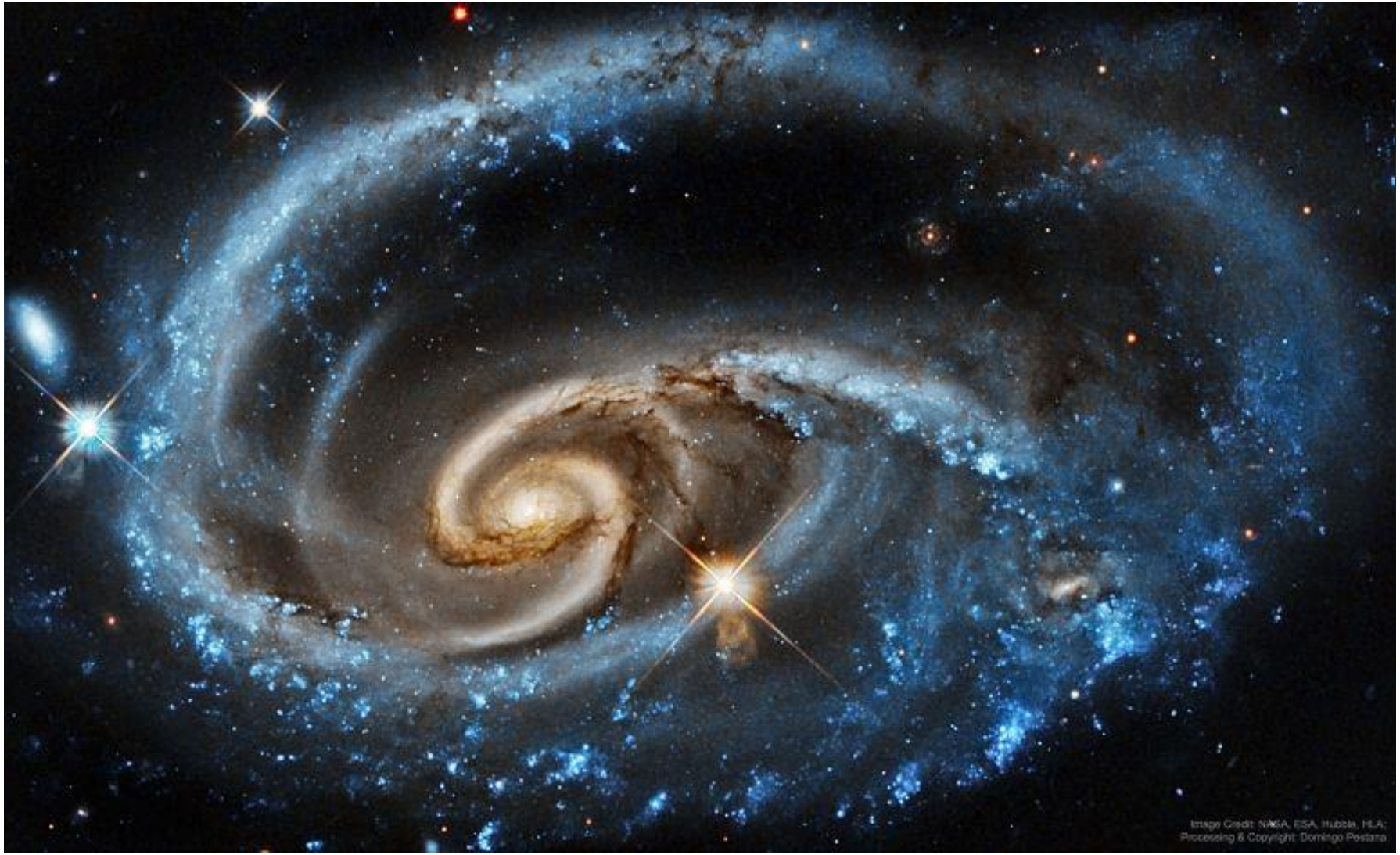
Outline

- New SI
- MSL developments
- Trends
- Next steps


kg
m
c
s
Δν
A
K
mol
K cd
cd
SI


SI
kg
m
s
A
K
mol
cd
h
c
Δν
e
k
N_A
K_{cd}

Precision Measurement…



…brings the universe into focus

Concept: Michael de Podesta, NPL

Practical Impact on Electrical Measurements

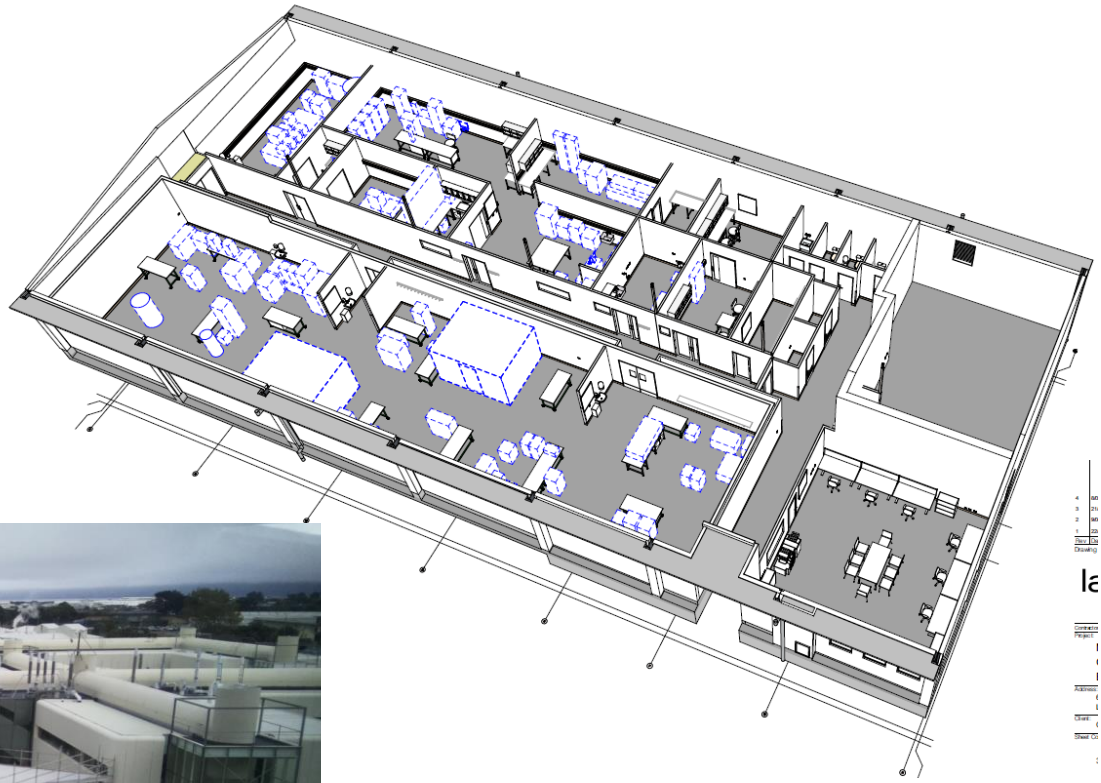
- We have been using values of the constants *h* and *e* that were agreed in 1990
- With the agreement on the new values of *h* and *e* coming into effect on 20 May 2019
  - volt shifts by about 0.1 ppm
  - ohm shifts by about 0.02 ppm
  - electrical watt changes by about 0.2 ppm

0.2 parts per million is $1,600 in $8 billion

0.75 % is $60 million in $8 billion

New Electrical and Temperature Laboratories

- Operating in 2020



New Capabilities in Development

- Watt standard is being upgraded in accuracy
  - will also characterise response of meters to harmonics
- Improved current transformer calibration
  - wider excitation range (1 % to 200 %)
  - accommodate more ratios

Context

- Is metering well controlled?

Yes

- Is metering as accurate as the code specifies?

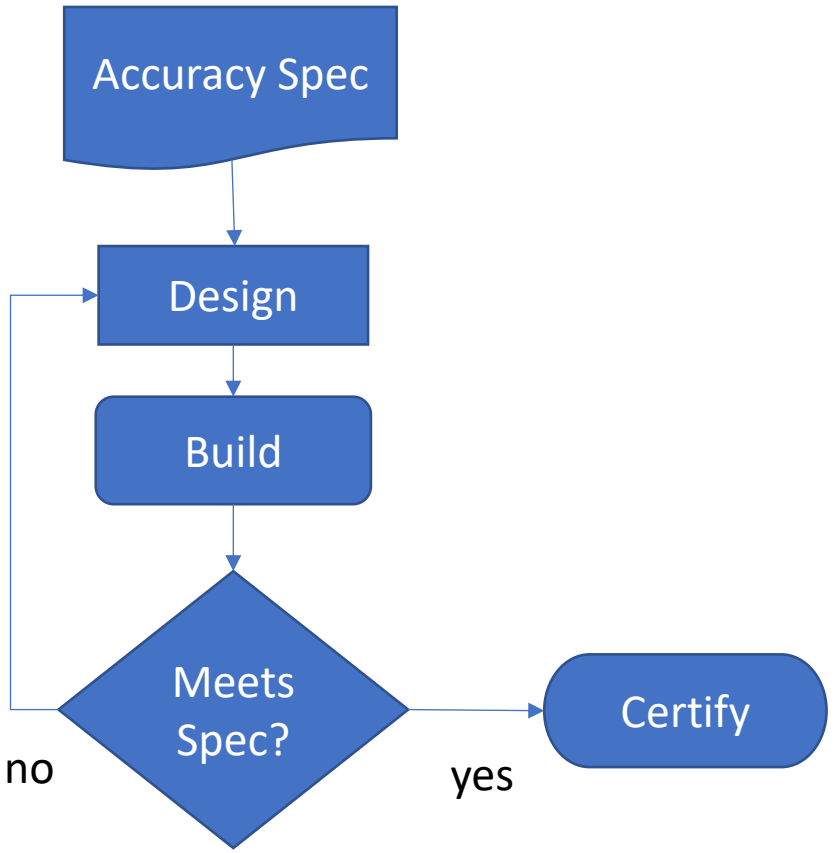
Yes and no

Metrology Basis of the Code

- Outcome focus
  - minimise dollars at risk
  - use best technology

accuracy by calculation

- Accuracy as achieved in actual use

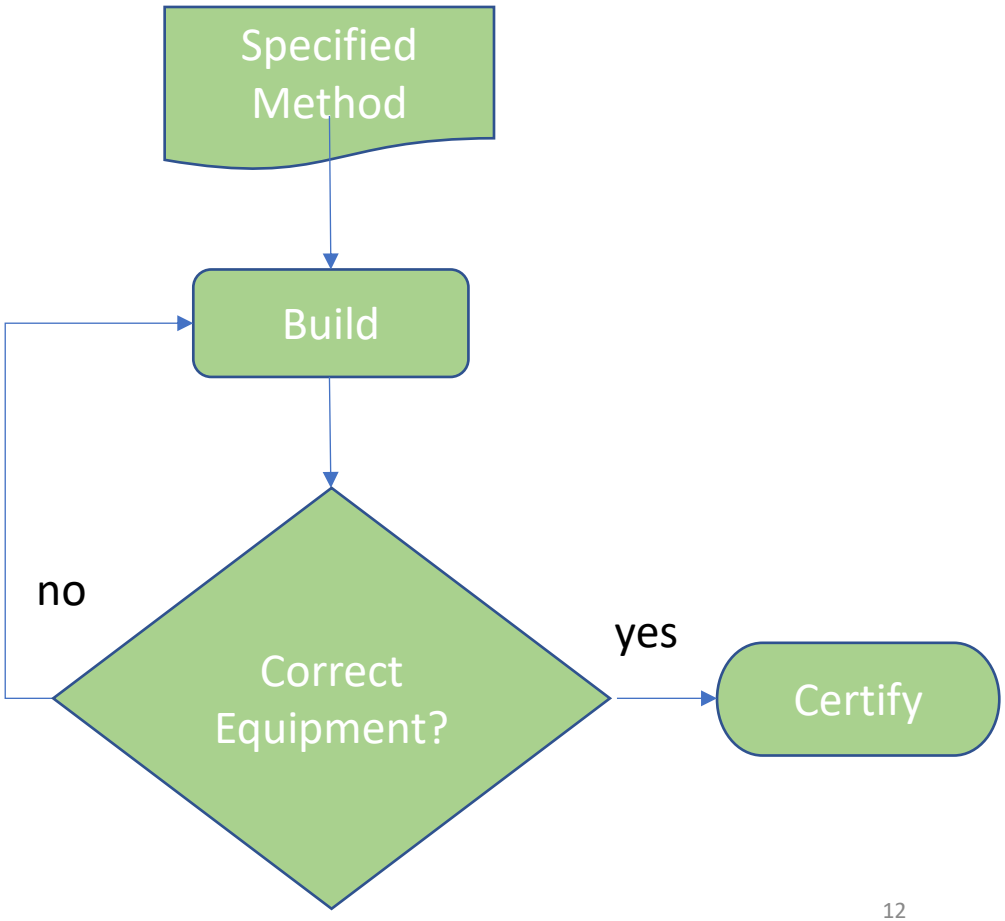


Simplified Options

- Input focus
  - perception of accuracy
  - specify equipment (IEC)
  - restrict technology

accuracy by method

- Accuracy depends on use
  - better or worse than claim



Trends

- Calibration requirements not factored into installation designs
  - access, safety and supply continuity requirements
- Saving cost at the expense of accuracy
  - using end to end testing as the norm rather than as a last resort
  - pressure to adopt lower cost unproven calibration methods
- Not focussing on ‘accuracy in actual use’
  - reluctance to engage with load profiles
- Class B ATHs tackling uncertainty issues
- Better meters
- IEC standards still not reflecting best metrology practice
- Testing of data storage in meters not part of IEC tests (clause 5 of schedule 10.8)

Need to Resolve

- Accurate metering or metering perceived to be accurate?
  - both matter
- Code mixes ‘accuracy by calculation’ and ‘accuracy by method’
  - not easy to be both ‘traceable to the SI’ and comply with the code
- ISO17025 is the metrology layer in the code
  - issues elsewhere in metering should not interfere with achieving measurements traceable to the SI under ISO17025
  - analogous to meter software having a metrology layer, protected from interference by other uses of the meter

Next Steps

- Remove code impediments to accuracy at high category sites.
- Clearly separate ‘accuracy by calculation’ vs ‘accuracy by method’.
- Create technically coherent guides.

Measurement Standards Laboratory of New Zealand

Thank you

A business of CallaghanInnovation