Bureau International des Poids et Mesures

Forthcoming Revision of the SI

SI Campaign Launch - Press Pack

May 2018

Contents

Introduction – using this pack

The CIPM has set up a Task Group for the Promotion of the SI to assist National Metrology Institutes (NMI) with their communications efforts. This Press pack has been written by the Task Group to support NMIs in launching their own campaigns in anticipation of the agreement to the revision of the SI units at the General Conference on Weights and Measures in November 2018.

The press pack reflects the messaging set out in a complementary resource, the SI Redefinition Brand Book.

We hope this pack will serve as an important resource for NMIs that do not have a dedicated communications, public relations or marketing team. It's designed to assist you with your own writing about the SI redefinition. While the contents are by no means exhaustive, you will find sample releases and frequently asked questions that you may wish to use. There are also tips to support your press campaign such as sources for imagery or training materials for spokespeople.

This book and additional resources can be downloaded from our website. The Task Group encourages NMIs to help with our aspirations to promote the SI by thinking creatively about their own communications, identifying what would work best within their own countries and, where possible, by sharing their resources via the BIPM website: www.bipm.org/en/si-download-area/

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Task Group for the Promotion of the SI - PR Expert Working Group

Please contact the Task Group to share resources via: revised.si@bipm.org

Press release

Feel free to edit this press release template to meet your needs.

The press release has been drafted assuming it is marking the beginning of the SI campaign period (20th May 2018) or you may wish to use it when you are holding your NMIs first event or activity that will begin your own campaign period and edit it to accordingly.

Send the press release a day or two in advance (usually via email) to all the press outlets that you feel might be interested – such as national newspaper science editors, science-focused magazines or high-profile websites, and radio or TV programme editors.

Ensure you include the notes to editors as this provides important background and supporting information that your journalists will need to cover the story.

The press release should include both your own NMI logo and the SI Redefinition illustration found in the Brand Book.

Possible headlines:

Measurement community prepares for overhaul of the International System of Units (SI)

Global movement raises awareness of upcoming changes to the International System of Units (SI)

Expected changes to International System of Units (SI) will support innovation

Measurement Scientists to Take Quantum Leap

International System of Units (SI) to be Based Fully on Natural Laws

Press Release Template

20 May 2018, [INSERT CITY, COUNTRY] – This May, the world's measurement community will come together to raise awareness of an expected overhaul to the universally accepted definitions of measurement – the International System of Units (SI).

These standards ensure our everyday concepts of measurement, whether of a metre or a second, remain comparable and consistent worldwide. Just like stable foundations are needed to keep a house upright, the SI needs to be future-proofed to remain relevant and stable for advancements to come.

The average citizen is blissfully unaware that it takes an enormous number of precision measurements to make modern daily life possible. For example, every component of a smart phone – processing chip, memory, accelerometer, microphone, camera optics – depends on an infrastructure of meticulously measured and tested scientific principles, materials, tools, and processes that combine to ensure it can reliably make calls, send texts, access the internet, and use GPS to help you navigate. The ability to make these precision measurements was made possible by redefinitions using natural constants (the ticking frequency of the element, caesium, and the speed of light) for the second and the meter in 1960 and 1983 respectively.

To help inspire similar measurement-based innovation, the world's scientists will soon redefine the four units used to measure mass, electric current, temperature and the amount of substance using "natural constants" as well. These constants are central to a set of well-established scientific reasoning and principles. They are the backbone of our ever-expanding knowledge of natural laws, like Einstein's well known $E = mc^2$, that describe how all mass and energy behave throughout the universe.

This will be one of the largest changes to the International System of Units (the SI) since its inception.

For the first time, all of the base units of measurement will be defined by fundamental constants of nature, rather than by physical objects. The change will mark an end to use of physical artefacts like the small platinum-iridium cylinder called the *International Prototype of the Kilogram* (the only object in the world with a mass of exactly one kilogram.). Artefact-based measurement units have several shortcomings; they artefacts may be susceptible to damage, and access to them may be limited..

Instead, under the proposed plan for the revised SI, the kilogram will be based on a fixed value for the Planck constant, and the definitions for the metre and the second, which are already based on constants. (The Planck constant relates the energy in one quantum, or photon, of electromagnetic radiation to the frequency of that radiation – a value observed in the natural world, which is inherently stable and can be checked anywhere in the universe.)

This SI redefinition is expected to be decided at the General Conference on Weights and Measures, which will take place 13-16 November 2018, and the changes will be implemented on next year's World Metrology Day, on 20 May 2019.**[INSERT SPOKSEPERON], [INSERT INSTITUTION]** – "This year's World Metrology Day marks an exciting step for the international measurement community. The proposed change to the SI definitions will not impact everyone's day-to-day lives immediately. But by improving consistency, reliability, and precision, these changes give us an international measurement system that can stand the test of time."

In total, the definitions of four of the seven base SI units will change — the kilogram, ampere, kelvin and mole. The new definitions will be based on fixed numerical values of the Planck constant (h), the elementary charge (e), the Boltzmann constant (k) and the Avogadro constant (NA), as well as on other three physical constants whose numerical values are already fixed in the present SI" or a similar formulation.

Over time, this change is expected to have an impact on scientific discovery and innovation with wide-reaching consequences in computing, electronics, aerospace, health and the environment, among many other sectors.

This move comes as scientists celebrate World Metrology Day, which marks the anniversary of the first ever international agreement on measurement, *The Metre Convention*, signed in 1875. This year's theme is the constant evolution of the International System of Units (SI) and aims to raise awareness of this expected fundamental change to measurement.

[NMI] the National Measurement Institute for [COUNTRY] will be marking this occasion by [INSERT TEXT ABOUT YOUR OWN ACTIVITY OR EVENT IF APPOPRIATE]

The biggest expected change will likely be for manufacturers of scientific instruments, some of whom may need to adapt their products in the coming year or years to accommodate the revised SI method for better determining measures of electric quantities like the ampere, the volt, and the ohm.

"Like a house needs solid foundations to keep it from falling; the world needs a stable basis for measurement that can remain relevant for innovations and discoveries to come. This can prepare us to solve society's greatest challenges," **[Insert name of appropriate metrology expert.]**

~ End~

Notes to Editors

[INSERT INFORMATION ABOUT YOUR NMI]

[INSERT SPECIFIC DETAILS ABOUT YOUR EVENT OR ACTIVITY]

About the BIPM

The signing of the Metre Convention in 1875 created the BIPM and for the first time formalised international cooperation in metrology. In this way the foundations were laid for the worldwide uniformity of measurement in all aspects of our endeavours. Historically this focused on assisting industry and trade, but today it is just as vital as we tackle the grand challenges of the 21st century such as climate change, health and energy. The BIPM undertakes scientific work at the highest level on a selected set of physical and chemical quantities. The BIPM is the hub of a worldwide network of national metrology institutes (NMIs) which continue to realise and disseminate the chain of traceability to the SI into national accredited laboratories and industry.

[INCLUDE THE FOLLOWING]

- Who to contact to set up an interview or ask questions
- A list of other resources you are providing – such as the Facts and Figures or Frequently Asked Questions
- Availability of a spokesperson
- Any multimedia you can offer to support the story.

The facts

These are things the press might want to know and so include this with your press release. You might wish to edit these with any national information that is relevant.

This document can be used for media, but also as the basis of any infographics, posters or other visual elements which may be produced as part of the SI redefinition outreach effort.

The Measurement Community

The measurement community is made up of 250 institutes from 100 countries.

The International Committee for Weights and Measures (CIPM) Mutual Recognition Agreement (MRA) has been signed by the representatives of 102 institutes – from 58 Member States, 42 Associates of the General Conference on Weights and Measures (CGPM), and 4 international organizations – and covers a further 157 institutes.

The General Conference on Weights and Measures, established in 1875 under the terms of the Metre Convention, to represent the interests of member states.

The Redefinition

The International System of Units (SI) is structured around seven base units, with at least another 22 (such as volume) derived from these.

It is expected that four of the seven base units (the kilogram, ampere, kelvin and the mole) will be redefined according to fixed values of natural constants. The new definitions will be based on fixed numerical values of the Planck constant (h), the elementary charge (e), the Boltzmann constant (k) and the Avogadro constant (NA), as well as on other three physical constants whose numerical values are already fixed in the present SI" or a similar formulation.

Since the second, metre, and candela are already defined by physical constants such as the speed of light, this revision will make the definitions of all seven base units consistent. They will all be defined in terms of universal physical constants.

Once the revision is implemented, the quantities for the physical constants will be fixed. The numerical values will be fixed by definition. For example, the value for the speed of light will remain the same, therefore the units defined by the speed of light – and other constants – will remain unchanged.

Practically, little will change; water will still freeze at 0.00 °C, your smartphone will function as normal. But this redefinition of the SI lays strong foundations for the building blocks of future measurement and scientific research.

The SI units form a foundation for measurement across the world that ensures consistency and reliability. Just like foundations are needed to keep a house from falling down, universal concepts of measurement are needed to support innovation now and into the future.

Mass

Mass is measured in kilograms (kg).

At the International Bureau of Weights and Measures in France, there is a platinum-iridium alloy cylinder called the International Prototype of the Kilogram (IPK). The mass of this artefact is what currently defines what we call a kilogram. The mass of this artefact may have changed since it was produced in 1884, but we have no way of knowing.

Under the new definition, a kilogram will be defined instead by using the Planck and other constants. Using fixed, agreed upon values, these constants, as invariable features of nature, will not change; an improvement upon the IPK, an artefact, which could have changed in mass, been contaminated, or even lost.

Another key benefit of the redefined kilogram will be improved scalability for measurements. When you use physical objects to measure things, accuracy decreases at sizes much smaller or larger than your standard.

A pharmaceutical company, for example, may need to measure the mass of chemicals for research on new drugs in quantities that are a million times smaller than a standard kilogram. The mass of a litre bottle of soda, in contrast, is about a kilogram. So, if you used equally sophisticated equipment today, the soda could be measured more accurately than the tiny quantities in drug discovery. The new definition of the kilogram will allow much better measurements of milligram and microgram masses.

The SI unit, mass, will be defined by taking the fixed numerical value of the Planck constant h to be 6.626 070 15 × 10^{-34} when expressed in the unit joules per second, which is equal to kg m^2 s^{-1}, where the metre (m) and the second (s) are defined in terms of the speed of light (c) and the hyperfine transition frequency of caesium (Δv_{Cs}).

Distance

Distance is measured in metres (m)

In 1791, a metre was defined as one ten-millionth of the distance from the equator to the North Pole. You can probably guess how difficult this would have been to check things against.

In 1875, a bar made of a platinum/iridium alloy was designated as the international prototype of the metre. While more practical, this was still not as accurate as we can now achieve. One of the issues with a prototype like this is that, over time, the length can potentially change.

Since 1983, we have precisely defined a metre as the length of the path travelled by light in a vacuum in 1/299792458 of a second. This accurate definition of the metre helps us measure the size and shape of things that are large, like bridges and buildings, as well as tiny things, like proteins and viruses.

The SI unit, metre, will be defined by taking the fixed numerical value of the speed of light in vacuum c to be 299 792 458 when expressed in the unit m s^{-1}, where the second is defined in terms of the caesium frequency Δv_{Cs}.

Time

The unit for measuring time is seconds (s)

Since 1967, the second has been defined by a number of cycles of the radiation from a particular caesium-133 transition – 9 192 631 770 to be precise. Before this, it was defined by the movement of the earth around the sun, which was recognised as not predictable enough for highly accurate timekeeping.

Accurate timekeeping underpins the functioning of important technologies, like GPS or the internet, as well as having an important role timestamping trades in the financial sector.

Ancient Egyptians used sundials and the Chinese used water clocks to tell the time, which was not very precise. Now, a caesium-beam atomic clock is accurate to within 30 billionths of a second per year (and it works in all weather).

The SI unit, second, is defined by taking the fixed numerical value of the caesium frequency $\Delta\nu_{Cs}$, the unperturbed ground-state hyperfine transition frequency of the caesium-133 atom, to be 9 192 631 770 when expressed in the unit Hz, which is equal to s^{-1}.

Electric current

Electric current is measured in amperes (A)

Amperes, or ‘amps’ for short, measure electric current, which is a flow of electric charge. Charge is commonly carried by electrons moving inside a wire, or, as in batteries, by ions in an electrolyte.

Accurate measurement of current is important for electrical devices like smartphones and laptops, as well as for developing sustainable batteries with longer lives.

Today’s SI definition of the ampere is impractical and is rarely implemented because there are alternative approaches for measuring electrical currents that are easier and more accurate. The current SI definition of the ampere describes the amount of current within two infinitely parallel wires that would produce a specific force between the wires.

For over 30 years, this has meant that the best electrical measurements have been tied to quantum-based voltage standards and quantum resistance standards instead of to the official SI approach. Nature-based approaches to precision electrical measurements have been common practice since the latter part of the 20^{th} century, and the redefinition of the SI ampere in terms of natural constants is effectively catching the definitions up to reality in the lab.

The new definition of the ampere is expected to be more intuitive and easier to realise. It is tied to natural quantum phenomena that has been used to create highly accurate voltage and resistance standards since the latter part of the 20^{th} century.

The SI unit, ampere, will be defined by taking the fixed numerical value of the elementary charge *e* to be $1.602\ 176\ 634 \times 10^{-19}$ when expressed in the unit C, which is equal to A s, where the second is defined in terms of $\Delta\nu_{Cs}$.

Temperature

Temperature is measured in kelvin (K)

It is possible for water to exist as a solid (ice), liquid and as a gas (water vapour). These three states coexist in stable equilibrium at a certain temperature, +0.01 °C, or 273.16 K. One kelvin is currently defined as 1/273.16 of this temperature.

However, this definition is unsuitable for scaling measurements and accurately measuring very cold temperatures (below 20 K) and extremely hot ones (over 1300 K). When you use physical objects to measure things, accuracy decreases at sizes much smaller or larger than your standard.

It is expected that the kelvin will soon be defined using the Boltzmann constant, a constant of nature. This will link the kelvin to the other SI units in a stable manner, independent of any particular substance.

Accurate temperature measurements are important in a wide range of areas, including manufacturing materials with specific desired qualities.

The Si unit, kelvin, will be defined by taking the fixed numerical value of the Boltzmann constant k to be $1.380\,649 \times 10^{-23}$ when expressed in the unit $J\ K^{-1}$, which is equal to $kg\ m^2\ s^{-2}\ K^{-1}$, where the kilogram, metre and second are defined in terms of h, c and $\Delta\nu_{Cs}$.

Amount of a substance

The amount of a substance is measured in moles (mol)

Currently, the definition of the mole is the amount of substance of a system which contains as many elementary entities as there are atoms in 0.012 kilogram of carbon 12.

The new definition will remove the present link between the mole and the kilogram.

The word ‘mole’ comes from the word ‘molecule’.

Accurate measurements of moles are used to calculate how much of a drug goes into your body, and for producing solutions of a precise concentration.

The SI unit, mole, will be defined as exactly $6.022\,140\,76 \times 10^{23}$ elementary entities. This number is the fixed numerical value of the Avogadro constant, N_A, when expressed in the unit mol^{-1} and is called the Avogadro number. The amount of substance, symbol n, of a system is a measure of the number of specified elementary entities. An elementary entity may be an atom, a molecule, an ion, an electron, any other particle or specified group of particles.

Luminous intensity

Luminous intensity is measured in candelas (cd)

A candela was once based on the brightness of a ‘standard’ candle. However, this ‘standard’ candle varied from country to country, and from candle to candle, so this definition was not sufficiently accurate

In 1948 the 'new candle' became the candela and was adopted worldwide. It was defined as: “The magnitude of the candela is such that the luminance of a full radiator at the temperature of solidification of platinum is 60 candelas per square centimetre”. In 1979 the candela was redefined in terms of the watt at only one wavelength of light.

It measures luminous intensity, and can be used to calculate the brightness of lightbulbs or lasers.

The candela is defined by taking the fixed numerical value of the luminous efficacy of monochromatic radiation of frequency 540×10^{12} Hz, K_{cd}, to be 683 when expressed in the unit lm W^{-1}, which is equal to cd sr W^{-1}, or cd sr kg^{-1} m^{-2} s^3, where the kilogram, metre and second are defined in terms of h, c and $\Delta\nu_{Cs}$.

For technical or scientific press you can include the *Information for users about the proposed revision of the SI* from the Brand Book V2.

Social media

Social media provides an opportunity to reach a broader audience with your messages. NMIs with a social media presence are encouraged to spread the word in this way.

Below are simple ideas for sharing information on social media channels, example posts to be disseminated, and templates for contacting partners to help spread the word.

Creating assets such as the World Metrology day poster, pictures, clips from videos or animations are very useful resources.

We strongly suggest you use your current outlets as these will remain supported after the end of the campaign and this topic is unlikely to sustain long-term interest. If you do create an account for the campaign be clear of its purpose and the dates that it ends.

Twitter

Twitter is the most established social media channel. More content should be posted here, as it is a busier network generally, meaning this content will reach the research community and the general public.

We suggest using #SIredefinition as the key hashtag to be used across all posting through the campaign. This will enable us to keep track of all of posts that use this hashtag, enabling analysis of the overall impact of the campaign.

Users will be able to engage with posts by:

- Retweeting the original post, sharing this with their own audience
- Liking the post, which will also share it with their own audience, as well as indicating positive sentiment towards the post
- Quote-tweeting the original post, which is commonly the user adding their own thoughts, while also broadcasting the message
- Replying to the original post, which will also share the post in other users' news feeds, but also has the potential to generate conversation in this space
- Generating a poll;

Tweet ideas:

- Since 1884, the kilogram has been defined by an artefact – from 2019, it will be defined by fundamental constants of nature: URL #SIredefinition
- Constants like the speed of light are not going to change, but a physical artefact might. We're redefining the definition of SI units to enable future #measurement research: URL #SIredefinition
- Water will still freeze below 273.2 K, but the way we define the kelvin is changing – learn how: URL #SIredefinition
- #ThrowbackThursday - In 1324, an inch was defined as the length of three barleycorns. In 1983, the metre was redefined by the distance light travels in vacuum in a tiny fraction of a second. : URL #SIredefinition
- The definition of the ampere, the unit of electric current, is becoming more intuitive and easier to realise: URL #SIredefinition
- Under the new SI definition, if you have $6.022\ 140\ 76 \times 10^{23}$ entities of a substance, you have one mole of it. Learn more: URL #SIredefinition
- As a National Measurement Institute, we are proud to be part of the redefinition of SI units. Read more about the future of #metrology: URL #SIredefinition
- Today is #WorldMetrologyDay – you can read more about the constant evolution of measurement: URL #SIredefinition
- Being a fraction of a second off doesn't make much difference when you're boiling pasta, but it would to someone like @UsainBolt. Learn how scientists are enhancing measurement: URL #SIredefinition

Facebook

Facebook is another important channel to reach a broad 'general public' audience. Content that is fun will be more effective on Facebook, as is evidenced in the example posts.

On this platform, users can 'react' to posts, with a 'like', 'love', 'haha' emoji etc. This will give us an indication as to the sentiment expressed by users towards the content. The reactions we should see the most of are 'like', 'love' and 'wow'.

Post ideas

- The definitions of SI units are changing. Don't panic, water will still freeze at 0.00 °C, and your smartphone will function as normal, but the redefinition lays a strong foundation for the future of measurement science. Learn how: URL
- As a National Measurement Institute, we are proud to be involved in the redefinition of the 7 base SI units. You can read here how this will affect the future of measurement science: URL
- The International System of Units (SI) enables consistent measurement, and therefore effective collaboration, for researchers across the world. In 2018, the seven base SI units are being redefined, to improve future measurement. Here's what you need to know: URL
- In this video, see how SI units are being redefined to enable future measurement research: URL
- Today is World Metrology Day, celebrating the importance of measurement research. From 2019, the definitions of SI units are changing – learn more about their constant evolution here: URL

LinkedIn

LinkedIn is a network used mainly for professional purposes, with uses like advertising job vacancies and following companies and institutions for industry news. Much of the content promoted on LinkedIn is in the form of posts, or personal blogs.

This will be an effective place to reach policymakers, and those interested in the SI redefinition from a professional perspective.

Post ideas

- Since it was established, the International System of Units (SI) has ensured that research carried out across the world has been as consistent and accurate as possible. To enable future measurement, the definitions of SI units are being redefined. Find out more: URL

- As a National Measurement Institute, we want to enable measurement science to flourish. Redefining SI units, as is expected to happen in 2018, will lay a strong foundation for the future technology development, and for science: URL
- Today, on World Metrology Day, we celebrate the importance of measurement. From 2019, the definitions of SI units are changing – read how, and why it will have a positive influence on future research: URL

Further activity

NMIs with a strong social media presence, and internal resource for managing it, may wish to conduct further activity on social media to increase awareness of the SI redefinition among existing and new networks. Two activities we would strongly recommend are using promoted social media, and giving partners the tools to act as champions on your behalf.

Promoted social media

Social media algorithms are making it harder and harder to get organic content noticed. The organic reach of large brand pages with more than 500,000 likes is limited to only 2% while most pages in general only receive 6% organic reach. Paid social media is believed to be more effective than organic for nearly 60% of social media marketers in helping their organisation achieve its goals, according to recent research from Clutch, a social media consultancy firm.

Paid advertising, on any social media platform, will help put your organisation and message in front of the right audience, at the right time and at the lowest cost.

If budget is available, NMIs should consider running a promoted social campaign using the posts above. We would recommend a budget of at least EUR 200 for each promoted campaign, to ensure impact. Guidance on targeting and executing a promoted social media campaign is available on request.

Template for partners — Each NMI has its own substantial network of partners, customers and collaborators that it works with day to day. These partners represent a great opportunity for further expanding the reach of publicity about the SI redefinition and World Metrology Day and can act as champions on your behalf.

Below is a template email that you may wish to use as the basis of communication with partners you think may be willing to help raise awareness of the SI redefinition. This should be accompanied by any assets – such as the poster, or animated video – that you have available, and example posts from the banks above. The easier you make it for partners to share content, the more likely they are to do so.

Template email

Dear XXXX,

On 20 May, the measurement community will celebrate World Metrology Day, an annual event showcasing the impact measurement has on our daily lives and marking the anniversary of the signing of the Metre Convention in 1875.

This year the landmark will be of particular importance, as it will mark the proposed redefinition of the International System of Units (SI), expected to be agreed in November 2018, when the General Conference on Weights and Measures meets. The theme of World Metrology Day 2018 is Constant Evolution of the SI.

For the first time we will see all of the base units in the SI explicitly defined by constants we can observe in nature. This removes the need to rely on artefacts. This change is needed now to ensure that the definitions will not need to be modified to accommodate innovation in future, and is important not only to scientists, but industry and society as well.

We are excited about this change and the developments in research and innovation it will unlock – and are running a campaign to raise awareness of the SI redefinition.

As a trusted [PARTNER/CUSTOMER/COLLABORATOR], we want you to be part of this important milestone, and therefore ask you to share the news on your own channels. You can find the press release attached along with example posts for social media and further materials. Please do share these as you see fit.

Yours sincerely,

XXXXXXX

Guidance on multimedia

Images and video are an important part of publicity efforts as they are engaging and help to demonstrate stories clearly to audiences. Journalists are also keen to receive images and video, so including these with announcements make it more likely that they will cover your story.

Do not forget to provide the SI illustration from the Brand Book.

Tips for images

- Ensure they are high resolution. Better quality images look more professional and perform better on all social media platforms.
- Keep them engaging. Images should stand out from the news feed, drawing people in to engage with the post itself. Avoid using images where it is not clear what they are without detailed explanation. If the image is of lab equipment, consider interesting angles, or setups. You should also consider showing real world use or application for a more general audience.
- Always include captions and copyright details to ensure accuracy.
- If you don't have your own images, consider using copyright-free images. Tools like Pixabay (https://pixabay.com/) or Pexels (https://www.pexels.com/royalty-free-images/) provide an archive of images under a CC licence, which means they can be used commercially
- Ensure they are the correct size. For up-to-date guidance on social media image dimensions, the following Google doc will be useful: https://docs.google.com/spreadsheets/d/1IpTYTTMJLcSXcPDtW9zSbPBHQyRdrLfKERohGIIkE_Q/edit#gid=476246499

Tips for video

- Ensure they are good quality and not low resolution, but also be mindful of not making them so large that they cannot easily be uploaded or shared.
- Be aware of the social media limitations. For example, uploading video to LinkedIn is only possible on mobile. Twitter will only allow video uploads up to a certain size or length (2:20 or 512MB).
- If filming in a lab, consider what is in the background. Ensure that there is nothing that is not suitable for public view, and ensure the surroundings present your organisation in the best light.
- Consider the audience of your video and where it will be hosted. Short clips of experiments will work well on social media to catch people's attention when they are scrolling through their feeds, while 'talking head' explanation videos can work well on websites when you have more audience attention.
- Consider alternative video styles. Animations work well for explaining complex principles in a clear and engaging way.
- Ensure your videos are branded to prevent them being used without your permission, and ensure you are raising awareness with every play of the video

Tips for sending images and video to media

Many journalists will have email restrictions, so never send large files as attachments. If you have an image that clearly illustrates your story and is visually engaging, embed a low-res version into the body of your email as an example of what you can provide. This should be accompanied by the promise of high-res versions of the image. An easy way to share high-res images with media is through file sharing websites such as Dropbox and WeTransfer. Many of these are free and easy to use, and appropriate for files suitable for public use, but check with your organisation and IT department first, as you may have a more secure file sharing system available.

For video, if it is appropriate for wider public use, you can upload it onto YouTube, or a similar platform, and share the link.

Always send clear captions explaining each image and video and guidance on copyright, as this will make the journalist's job easier, guarantee accuracy and ensure the right permissions are granted.

Guidance on spokespeople

The right spokesperson can be the difference between a story receiving coverage or not. An organisation should think clearly about who they chose to represent them publicly.

Ideally, you should select a number of spokespeople who can each cover topics important to your organisation. In general, all spokespeople should be knowledgeable on the topic they are being asked to speak on, well briefed on what will be asked of them, and able to discuss complex topics in an accessible and engaging way.

For the SI redefinition, you should consider selecting an overall spokesperson who can cover the general points and background, but may wish to also have further spokespeople who can be called on to cover specific points, such as more detail on one SI unit, on the history of the SI or the redefinitions themselves.

An ideal spokesperson will:

- View every interview as an opportunity to deliver positive messages
- Organise their points in a concise and interesting manner
- Be conscious of the target audience. (Unless it is a specialist outlet, avoid jargon and scientific terms.)
- Be engaging, confident and likable, not defensive or nervous

Once you have chosen your spokesperson or spokespeople, it is important that they are well briefed to ensure that you get the most out of any interviews, but also to ensure that they are comfortable responding to potentially difficult questions.

Tips for talking to media

- Avoid jargon and explain everything in as simple language as possible. Ask yourself, would a 15-year-old understand it?
- Use analogies if they help to explain complex ideas in more simple terms (Is it similar to something people do every day, or is it the same size as a household object, for example.)

- Always bring your descriptions back to the end user. How will this make a difference to people's lives?
- Consider everything 'on the record'. Journalists do not 'switch off' and are always listening for a story.
- Be sure to talk about your organisation in the most positive terms, to inspire confidence and prove your conviction
- Do not discuss anything that you do not want to be made public. It is a good idea to check details with your colleagues beforehand if you are unsure.

Tips for dealing with broadcast media

- Have just two or three points in your head that you want to get across. Broadcast clips are extremely time limited.
- Gesture if you want to, but remember movements are exaggerated on camera so try to keep them to a minimum.
- Take a breath before answering, and don't rush.
- Try to repeat the question at the start of your answer. This allows the broadcaster to edit out their question and keep the focus on the subject.
- Avoid wearing bright colours or patterns if possible, as these can interfere with the picture on TV.
- Always be aware of what is in shot. If you are in a lab, is it tidy?
- Don't look directly at the camera unless instructed to do so. Your interview should be a conversation with the presenter

Dealing with difficult questions

Some journalists will ask more searching questions than others. It is advisable to be extra cautious and ensure you avoid mentioning anything you don't want to be public knowledge.

Be prepared to be asked questions about current political issues. Agree on your responses with colleagues and funders ahead of time.

If you are not in a position to answer a question, feel free to politely decline. Using phrases like 'I'm afraid I'm not the right person to answer that', 'at this stage it is too early to say', or 'I can't comment on that at the moment' seem less defensive than the clichéd 'no comment.'

If you don't have all the details to hand, offer to follow up with them via email. A journalist would rather have the correct answers!

Frequently asked questions

These are some ideas on how you might respond to specific questions.

What are measurements for?

Measurements are the quantitative way to compare one thing with another. The International System of Units, also known as the SI, is the most widely used system of measurement in the world. It is a coherent system of seven base units (kilogram, metre, second, ampere, kelvin, mole, candela) which allows science, industry and trade to measure all physical objects and phenomena in the same way, using the same units and get the same number.

How are the units of measurement defined?

Originally measurement units were defined by physical objects or properties of materials. For example, the metre was originally defined by a metal bar exactly one metre in length and subsequently in terms of the wavelength of light. However, these physical representations can change over time or in different environments, and are no longer accurate enough for today's research and technological applications. Over the last century scientists measured natural constants of nature, such as the speed of light and the Planck constant, with increasing accuracy. They discovered that these were more stable than physical objects, and fixed numerical values to these constants. Therefore, the SI base measurement units are being redefined so that they are rely on these natural constants, the most stable things known in the physical world. These natural constants do not vary, so are at least one million more times more stable.

Why do we need more accurate definitions?

As science advances, ever more accurate measurements are both required and achievable. The standard and definition must reflect this increasing accuracy. The kilogram has been based on a physical object certified in 1889, consisting of a cylinder of platinum-iridium and it is the last unit to be based on an actual object. Its stability has been a matter of significant concern, resulting in recent proposals to change the definition to one derived from constants of nature.

By defining measurement units in terms of constants means that the definitions of the units do not need to be changed over time. If we develop more accurate ways of measuring these constants, the definitions still apply, they can just be realised with greater accuracy.

What is the SI?

The International System of Units (SI) is a globally agreed system of measurements. The SI has seven base units and a number of derived units defined in terms of the base units. The SI units express measurements of any quantity like physical size, temperature or time. This International System of Units is necessary to ensure that our everyday units of measurement, whether of a metre, or a second, remain comparable and consistent worldwide. Being inaccurate by a fraction of a second might not matter for cooking pasta, but it becomes very important for determining who won the 100 metres at the Olympics or in high frequency stock market trading.

Standardising such measurements, not only helps to keep them consistent and accurate, but also helps society to build confidence. For instance, the kilogram is used every day, and defining this unit helps to outline how much food a shop is selling, and means that consumers can trust that the shop is really providing the amount they say they are. This consistency is also relied on to ensure the correct dosage of medicine is taken even when measurements are very small.

In 1889 the international prototypes for the metre and the kilogram, together with the astronomical second as the unit of time, were units constituted as the base units metre, kilogram, and second, the original MKS system. In 1946 the scope of this was extended to adopt the ampere giving the four-dimensional system based on the metre, kilogram, second, and ampere, the MKSA system.

Following an international inquiry by the BIPM, in 1954 the introduction of the ampere, the kelvin and the candela as base units was approved joining the original MKSA system. The name International System of Units, with the abbreviation SI, was given to the system in 1960.

The creation of the decimal metric system, the ancestor to the SI, was considered to be on 22 June 1799, when two platinum standards representing the metre and the kilogram were deposited in the Archives de la République in Paris.

What are the seven base units?

- The kilogram (kg) – the SI base unit of mass
- The metre (m) – the SI base unit of length
- The second (s) – the SI base unit of time
- The ampere (A) – the SI base unit of electrical current
- The kelvin (K) – the SI base unit of thermodynamic temperature
- The mole (mol) – the SI base unit of an amount of substance
- The candela (cd) – the SI base unit of luminous intensity

For further information on how to use SI units, please visit: www.bipm.org/en/measurement-units/base-units.html

Why is the SI important?

The SI units form a foundation for measurement across the world to ensure consistency and reliability. Just like foundations are needed to keep a house from falling down, universal concepts of measurement are needed to support innovation now and in the future.

SI units can provide new opportunities for innovation. Some examples where greater accuracy is supporting better methods and understanding with a positive impact on society include:

- **The accurate measurement of temperature**. This will support the ability to identify and measure reliably very small changes across large time periods with greater accuracy. Therefore, it will allow for more precise monitoring and better predictions for climate change.
- **The more accurate administration of drugs**. The pharmaceutical industry needs to use a standard for very small amounts of mass in order to make dosages of medication even more appropriate for patients.

SI units can help us support innovation into the future. As our ability to measure properties improves, the standards we have for measurement will need to keep up. SI units based on physical constants are important for developments to come:

- The accuracy of services like Global Positioning System (GPS) are limited by our ability to use standard units, in this case, the second to measure time We can track our locations effectively because we can establish time using the SI definition of a second, which can be realised by an atomic clock. This advancement was made possible because society had defined the second more accurately well before we had even discovered what it could be used for. The atomic clock was made before computing really took off. Now accurate timing is a fundamental part of the industry; without it the internet, mobile phones and other technologies could not work reliably.

What is the SI redefinition?

The global metrology community anticipates that a revision to the SI units will be agreed in 2018, when the General Conference on Weights and Measures (CGPM) meets from the 13-16 November.

This decision is expected to mean a more practical definition of the SI. All of the units would be expressed in terms of constants that can be observed in the natural world (for example, the speed of light, the Planck constant and the Avogadro constant). Using these unchanging standards as the basis for measurement will mean that the definitions of the units will remain reliable and unchanging into the future.

The new definitions will be based on fixed numerical values of the Planck constant (h), the elementary charge (e), the Boltzmann constant (k) and the Avogadro constant (NA), as well as on other three physical constants whose numerical values are already fixed in the present SI" or a similar formulation..

You can find more information on the constants the SI units will be based on here:

www.bipm.org/en/measurement-units/rev-si/

Why do we need this change?

For the first time we will see all base units in the SI dictated by constants of physical science we observe in nature. Using the constants we have found in nature as our universal basis for measurement allows not only scientists, but also industry and society, to have a measurement system that is more reliable, consistent, and scalable across quantities, from very large to very small. This change is needed to ensure that the definitions will not need to be modified to accommodate innovation and even more accurate measurement techniques in future.

There are two key ways the SI will change to create a more stable and future-proof basis for measurement:

It will take physical artefacts out of the equation:

- Many of the SI units began life based on a physical artefact. Previously, in order to ensure that quantities like the metre remained consistent, there was a physical representation of the measure (such as a metre stick) that was used as a basis for all of the other metres globally. The kilogram is still defined by a physical object– equal to the mass of the International Prototype of the Kilogram (IPK), a physical artefact stored at the International Bureau of Weights and Measures in France.
- This technique has the limitation that the properties of the artefact may change over time and it could be damaged. There can also be changes to size due to the process of translating measurements from one artefact to another. As a replica is created from the original kilogram, small differences could occur that may not be noticed immediately, but in time, and with improvements in technology and science, may become significant.
- It can also be extremely difficult to check measurements this way. Not only because the physical artefact will need to undergo a process of cleaning to ensure nothing is affecting the measurement (apparently chamois leather will do the trick for the IPK) but if we want a universal standard for measurements we need a definition that can be realised anywhere. As such, a change is necessary to democratise this process, so that definitions can be checked anywhere in the world.

Separating the realisation of the unit from its definition for the first time ever:

- For the first time all the definitions will be separate from their realisations. Instead of definitions becoming outdated as we find better ways to realise units, definitions will remain constant and future proof.
- For example, the ampere is currently defined as the magnetic force between two wires at a certain distance apart, which means that it uses the realisation of measurement to define it. However, advancements like the development of digital voltmeters and the advent of the Josephson Effect, have revealed better ways of realising the ampere, making the original approach obsolete.

What does this mean in practice?

On the surface, it will appear not much has changed. In the same way that if you replaced the decaying foundations of a house with new shiny ones, it may not be possible to identify the difference from the surface, but some substantial changes have taken place to ensure the longevity of the property.

These changes will ensure that the SI definitions will never become outdated by advancements in technology, but will continue to remain robust.

When will the proposed change come into effect?

Redefinition, if agreed, will come into practice on World Metrology Day, 20 May 2019.

What is World Metrology Day?

World Metrology Day is an annual event on 20 May during which more than 80 countries celebrate the impact measurement has on our daily lives.

On this day, the international metrology community, which works to ensure that accurate measurements can be made across the world, raises awareness of the impact and importance of having reliable measurements. The theme for World Metrology Day 2018 is Constant Evolution of the International System of Units (SI).

This year's theme was chosen due to the proposed SI redefinition, expected to be agreed in November 2018, when the General Conference on Weights and Measures meets. This will be one of the largest changes to the International System of Units (the SI) since its inception.

The date marks the beginning of a formal international collaboration in metrology in 1875, when the first international measurement treaty, the Metre Convention, was signed by representatives from 17 nations to agree on the coordination of measurement.

This treaty saw the creation of organisations to oversee the running of the institute, including the General Conference on Weights and Measures, CGPM.

In 1921, at the 6th meeting of the CGPM, the mandate of the body was extended from mass and length to all physical measurements. In 1960, at the 11th meeting, the ‘International System of Units’ was established.

Who agrees to the SI?

The signing of the Metre Convention in 1875 saw the creation of the BIPM. It operates under the supervision of the CIPM which is itself set under the authority of the CGPM.

The CGPM is the General Conference on Weights and Measures that meets every four to six years. With delegates from all of the 59 member states, this body discusses and chooses to endorse changes to the SI, after taking on board advice from the CIPM.

The CIPM is the International Committee for Weights and Measures. It is a committee made up of eighteen individuals, each of a different nationality, nominated by the CGPM for their high level of understanding in the field. The CIPM is still to this day responsible for decisions about the SI with the goal of creating a reliable basis for measurements that can be used now and into the future. The international community now includes 59 Member States, and 42 Associate States and Economies.

The BIPM is the International Bureau of Weights and Measures based in Sèvres where it has laboratories that provide metrology services for the member states. It also carries out coordination and liaison activities and houses the secretariat for the CIPM and its consultative committees. The BIPM’s original purpose was to house the international prototypes defining units of the SI, as such it is where the international prototype of the kilogram resides.