FUTURE TELECOMS INFRASTRUCTURE REVIEW– call for evidence

also with relevance to the reviews: 5G Network Deployment Pilots/mobile connectivity on trains

Dynamic Progress by Revivifying the Precautionary Principle (re: 5G), anticipating new markets for electromagnetic hygiene

Background: I have studied digital trends / infrastructure, peer-reviewed precautionary research, and environmental-health ramifications and implications for over six years.

I hope you find this submission stimulating and helpful, and that, together with submissions and evidence of like mind, it will help to inspire creative, dynamic, policies that revivify the Precautionary Principle in this field – with a goal of future-proof (i.e. truly non-toxic) digital connectivity – to profound societal / economic benefit over the medium and longer term.

Thank you.

Introduction

5G, an infrastructural and wider trend towards 'next generation' digital connectivity, is a step-change for humanity that can be approached through the corrective lens of biological wisdom, revivifying the Precautionary Principle in line with all the cutting edge, expanding, precautionary evidence – or – pursued with short-sighted recklessness, with under-estimated chronic negative risks and consequences for our society and economy. I encourage all to think with probing depth not merely about the technical feasibility of 5G but creative ways forward that future-proof environmental health and human wellbeing (including foetal) while taking policy steps to help Britain become a world leader in the emerging markets for safer digital products (i.e. reduced RF-radiation exposure) and electromagnetic hygiene, including low-EMF facilities and spaces, to public benefit. Because 5G is at an embryonic stage, you each have a historic opportunity to help to guide UK choices wisely, along these inspiring lines.

A) Prioritising Electromagnetic Hygeine In themselves, 5G fixed networks (fibre) can create high bandwidth that fulfils electromagnetic hygiene. In itself, when not appended to pulsed-RF cells (FTTC), state of the art fibre is a gift to humanity. In transmission by well-managed fibre (i.e not contaminated by HF transients/EMI), high-volume data traffic avoids the numerous emerging / published medical and ecological costs associated with increasingly dense, pulsing, electromagnetic radiation (microwave / mm-wave, both also known as "pulsed RF") passing through living tissue.

Having tracked the peer-reviewed precautionary science very closely for over six years, and its ever-accelerating findings, I observe institutions are struggling to keep pace with it and are failing to translate it into exciting, non-toxic, future-proof policies. At worst,

they appear decades behind – clinging to the old, dying paradigm that only thermal or tissue-frying effects from extremely powerful pulsed RF need to be obviated; clinging to it, in effect, like a piece of the Titanic.

It is a regrettable way of the world that toxicology often outpaces institutions, with timid reactionary advisory appointees (re: clinging to the dying thermal paradigm) rather than progressives who are making game-changing precautionary discoveries that will spur true human progress. Economies are then hit by downstream costs and human tragedy as they struggle to catch up and shape wiser, dynamic policy for non-toxicity and its profitable markets. (Re: asbestos, lead, chemical carcinogens, etc., and above all smoking).

Therefore it is wisely pragmatic to prioritise electromagnetic hygiene and its proliferation (e.g. all the rapidly evolving fibre-only means) over dense electromagnetic pollution and proliferation (dense pulsed RF, see below) wherever possible – together perhaps with evidentially less risky, digitally-pulsed infrared and visible light communications (LiFi /VLC), pending independent premarket optical and biological testing.

[►Silicon Valley is looking into potentially LiFi-enabled mobile devices; Germany has trialled LiFi school desks] Compared to pulsed RF, the carrier waves of such means barely penetrate our living tissue and are now known to reflect / propagate around obstacles (Edinburgh University: ►see its home-grown talent) opening up potentially safer possibilities for mobile connectivity (when 2-way: in development) with far more bandwidth than the bioactive/polluting output that less forward-looking 5G (pulsed-RF) will otherwise create.

You can all make a fabulous difference here by tactfully and skilfully prioritising electromagnetically-clean options and innovations (e.g. fibre-to-fibre /optical IoT media) by means of, e.g., policy, dissemination, education, behind-the-scenes advocacy, prizes for linked innovation (bypassing/ removing pulsed RF-EMFs) and economic / market stimuli. Anyone of vision can see that the markets for such safer means will be globally enormous as the mountainous extent of published precautionary science filters into public awareness – an awareness, in growing subsets of our own society and globally (J, below) that is already far outpacing the institutional jetlag that is holding back progress! By allying skilfully with this trend, Britain will get ahead of more head-in-the-sand competitors, caught up in cycles of denial (denial of the fast-growing precautionary evidence) to the longitudinal benefit of our national wellbeing and productivity.

B) Living under siege: problems of dense 5G (pulsed-RF options) An urgent concern is the density of (wireless/mobile) 5G electromagnetic pollution, especially in urban / suburban environments / transport/ crowded spaces / misnamed ‘smart’ homes, if 5G is

implemented as currently conceived, without up-to-date precautionary insights. To truly future-proof national wellbeing, everyone in public service engaged in 5G issues – DCMS included – would benefit from alert, inquisitive, direct access to the published precautionary findings, rather than secondhand, bowdlerised summaries (if I can offer a piercing insight) from timid delegated bodies: the understandable but damaging jet-lag that occurs - sometimes for decades - before toxicology is translated into everyday life, missing key markets for cleaner ways forward.

Rural Britain is currently on track to remain relatively healthy. As you know, we are gearing up to use 700MHz for rural (wireless) 5G. This is an available part of the microwave spectrum (just below 4G's lower tier) which – although out-performed by high-bandwidth fibre/fibre optics – is fairly efficient at carrying digital information over distances. Yes: it will be biologically active (all pulsed RF has this capacity, as all my scientist-contacts in, for example, the International EMF Scientist Appeal, have been working conscientiously for years to bring to light) – but at maximum remove from housing, it is a less pressing, less urgent concern than the higher-density, urban/suburban 5G options (such as "massive MIMO") that will be proposed to you.

For example, in urban/suburban settings, where distance isn't an issue, high-density, higher frequency 5G is being explored as an option. At first sight, to the innocent layman, the idea of many smaller transmitters that transmit higher-frequency pulsed RF (= higher-frequency microwaves and increasingly, pulsed mm-waves) to obtain higher bandwidth, may sound vaguely vaguely benign, but the reality – as I hope you will all appreciate – is far more visceral. Perhaps I could describe this somewhat so that you can begin to imagine, bodily, what it would be like to live in this kind of inescapable, dense, electromagnetic pollution.

As you know, our cells and DNA use highly delicate electromagnetic signalling that is magnitudes below (several thousands of times weaker) than the artificial levels we are already generating wirelessly, in growing density and complexity. Professor Martin Pall, winner of 8 international awards, has unveiled a master mechanism of harm, earning a Global Medical Discovery listing, that accessibly and precisely explains how today's wireless output (digitally-pulsed RF) tends to over-stimulate our cells (via their voltage-gated channels) rapidly driving a rise in one of the most toxic substances in our bodies – peroxynitrite. This helps to explain, he sets out in exact lucid detail, the key downstream toxic effects seen in paper after precautionary paper – particularly recent papers (for example, E, below). Wireless 5G is currently in this broad category of radiation (pulsed RF): the toxic risks of this mechanism rise with public exposure.

Now: because higher-frequency pulsed RF struggles to pierce walls, very high-density transmitters ("small cells") are being looked at to achieve inescapable line-of-sight transmission. At the same time, 5G phones with higher radiated power (especially from

the back) are being considered, simultaneously working as relay transmitters, further raising passive exposure. This means that, whereas to date you have had a degree of choice in avoiding dense pulsed-RF pollution, you will now face dense, chronic, blanket pollution (worsened by pulsed-RF types of IoT) – just when precautionary findings, already mountainous, and global scientist-support, is accelerating! This is the opposite of future-proof, and adds urgent merit to the electromagnetic-hygiene options described and the rising global paradigm for such advances.

For alhough radiated power will be less at 10m from a small cell than a macrocell (full scale phone masts in use today), our exposure levels, even before phones / dense IoT / other inbuilt sources are factored in, will overlap with the levels at which important, precautionary findings have been found: for example, WiFi-source damage to animal's organs (see E) and the rise in skin cancer and other common cancers Professor Dode et al found up to1km from macrocells (see the full research paper, figures 1- 8: Mortality by neoplasia ..., Science of the Total Environ, 2011).

C) Special Problems from 5G mm-waves (high-frequency pulsed RF), if used As you will appreciate, 5G mm-waves (being higher-frequency) will concentrate their energy and most bio-effects (including from the abrupt digital pulse) in our surface tissue: our skin, eyes, testes, peripheral nerve/ blood cells. Research from Israel has revealed risks to the pain receptors in our sweat glands (►see Dr Y Steins, co-researcher, 2017). Equally important, we must think of the 25% of Britain's population (►Sanger Institute 2016) with higher skin-cancer risks, due to the recently discovered prevalence of the "silent" red-hair gene, i.e. freckle-prone, dark haired / pale skin types. How will pulsed-RF 5G rollouts, if permitted, i.e. dense, chronic, and inescapable ("massive MIMO") affect vulnerable / abnormal skin-cells? Melanoma risk will rise sharply.

Again, one has to think in a future-proof way, and compensate for institutional jet-lag. Including, for example, the alleged long-running conflicts of interest etc. in reactionary self-appointed advisory bodies such as ICNIRP (also noted, for example, by Caroline Lucas MP), who have clung to the old, dying, paradigm – if I may repeat the simile – like a lump of the Titanic, i.e. the 1950s notion that only extreme, thermal/tissue-frying levels of RF merit enacted caution.*

We need also to avert i) 5G damage to urban/other trees' surface tissues, including leaves / bark: British trees are already under pressure, re: ash dieback etc., and ii) 5G damage to bird and insect populations (including mmwave resonance effects in mm-sized micro-fauna) – notice, for example, the important Mount Nardi report for ►UNESCO by botanist Mark Broomhall: shocking declines in a huge number of bird and other species, in a World Heritage wildlife location, spatially pegged to its telecoms pollution levels and their timeline (for a copy, see the Environmental Health Trust, online). Also note that in their highly respected annual report on new global

conservation challenges, Professor Bill Sutherland et al have flagged blanket pollution from 5G transmitters or “small cells”, where used (►Trends in Ecol & Evol, v 33/1, Jan 2018).

We also need to avert increased antibiotic resistance, as recently found from ‘weak’ mm-waves Soghomonyan 2016. [Update: We should also be aware that certain scientists perceive risks to the conditions in which life has evolved, re: Koenig/Cherry, from overseas plans to rush 20,000+ high-power internet satellites into Earth’s magnetosphere and ionosphere].

Crucially: the phased-array technology proposed mainly for 5G mmwaves (ie, the short-pulse, beam-forming 5G generated from infrastructure and handheld devices) will plausibly risk re-radiated effects (►Brillouin precursors) within our bodies i.e. deep penetration of our tissue. This could be a key, overlooked, hazard with hidden chronic consequences.

D) Citizens at Special Risk from 5G: planning for disability and arresting its rise There is an urgent need for all of us, without exception, to get up to speed with the latest precautionary evidence for pulsed-RF intolerance (head pain, lost productivity, severe cognitive problems, cardiac reactions, insomnia etc) and all the emerging harm and disability this can cause. As you know, it was first comprehensively confirmed by Russian / American military researchers studying pulsed-RF/radar operators. See, for example, Professor Karl Hecht’s impressive work on Russia’s evidence of harm, and the French former radar-research leader, Dr Pierre le Ruz.

As you may know, a major hindrance to progress has been the poorly designed studies that have dismissed pulsed-RF intolerance (often termed “electrosensitivity” or ES / EHS) based on whether people have instantaneous on/off pain etc. when sources are switched on/off. As you will appreciate, crippling headaches (for example) from any source can be slow to build and slow to ease (even taking hours). Such tests have been a misleading red herring, unhelpfully delaying recognition, diagnosis, treatment, and the creation of electromagnetically hygienic spaces (such as low-EMF hospital waiting rooms) to accommodate the adults and children in our society whose lives – according to pioneering GPs like Dr Andrew Tresidder and growing numbers of EMF scientists – are being blighted by heavy exposure, many without realising the emerging link, and who stand to be further blighted if 5G (where wireless) is blindly and densely implemented.

The new evidence includes measurable toxic markers and reduced brain blood-flow in those affected (►675 patients: Belpomme et al 2016, peer-reviewed) and the new pilot research showing striking MRI brain scans (physical differences) in badly affected individuals compared to those who are so far able to tolerate exposure.

Just as Dr Lamech (peer-reviewed) discovered that relentless, high-intensity pulsed-RF “spikes” from some smart meters tipped many patients into pulsed-RF intolerance / EHS, such that they had to give up their jobs / homes, it is heavily likely that increased pulsed-RF exposure from 5G (if unaddressed) will ramp up levels of intolerance and associated disability / non-productivity.

Precautionary scientists are formerly seeking an ICD (international disease code) for such RF intolerance / EHS, and recent court cases (France, Spain, Australia) yielded disability payments for those who are affected. [Update: ESA has been awarded to some cases in the UK]. As it is only a matter of time before our own RF functionally-disabled adults and children are awarded stronger accommodation, of whatever form, it is best to future-proof British 5G trends and create truly humane conditions by maximising digital options that are electromagnetically hygienic (e.g. fibre schools/clinics, easy fibre hook-ups for devices, and independently health-tested 2-way LiFi etc.)

Such options will be the new “organic”, followed by a huge market globally, as grassroots awareness of the wealth of precautionary science inevitably grows, in this age of rapid peer-to-peer media, bypassing the jet-lag described (including conflicted bodies clinging to the dying 1950s paradigm: see the AGNIR 2012 report scandal, Starkey 2016). Let us collectively support this healthy trend, and aid Britain to become a policy-supported commercial and educational world-leader in electromagnetically clean ways forward.

E) Risks to all, illuminated by new toxic findings from ‘weak’ pulsed RF Let us take an example with which we are all familiar: WiFi. In the last decade, significant toxic biological effects of WiFi and WiFi-analogue exposure (particularly near-field exposure) have appeared in paper after peer-reviewed paper. Measured in RF volts per meter, these exposures are often less than near-field outputs / passive exposures broadly anticipated from (if the pulsed-RF trajectory is uncorrected) 5G cells or masts and many 5G devices.

Here are illuminating examples for you: WiFi router & analogues’ damage to tested animals (revealing likely matching / similar risks to adults and children] Damage to Kidney: Kuybulu 2016/ Testes: Akdag 2016 / Eyes: Tȍk 2014/ Throat: Aynali 2013/ Foetal brain, liver, kidney: Celik 2016, Ozorak 2013 / Skin: Ceyhan 2012 / Blood: Chaturvedi 2011/ Forming teeth: Ciftci 2015/ Brain: Desmunkh 2015; Megha 2015; Kesari 2012/ Thyroid: Agustino 2015 / Nervous system: Ghazizadeh 2014/ Heartbeat: Sailh 2013 / Conception: Shahin 2014/ Puberty: Sangun 2015 / Learning & memory Shahin 2015 / Hormonal level: Yuksel 2015 / Foetal neural harm: Othman 2017/ Pancreas: Salah 2013, Topsakal 2017 (re: diabetes) [And so on, all peer-reviewed]

More WiFi examples [ditto]: antibiotic resistance: Taheri 2017 / sperm damage: Avendano 2011/ increased mercury poisoning from dental fillings: Paknahad 2016. Notice also: new findings from current phone-masts, e.g. immune cell damage in surface tissue (to 80m from masts) Zothansiama 2017; amputee pain at equivalent to 70m, Romera-Ortega 2016 Notice also: accelerated body cancers (animals simultaneously exposed to a second carcinogen) from exposure levels that overlap with wireless tablets: Lerchl 2015. (Re: education infra-structure / current wireless classrooms) ►Also free radical damage to our hearts: Bandar 2017

The fact that each of you may be unaware of the above is a sorry reflection of dysfunctional systems that have been holding back awareness and vital progress. For scholarly evidence of this problem, see, e.g “Downplaying Radiation Risk” by Cambridge-trained physicist Nicola Wright (Corporate Ties that Bind, ed M J Walker 2017).

Two further institutional-jetlag risks are: under-estimation of the market value of low-EMF innovation and electromagnetic hygiene, and under-estimation of the rapidity of shifts in consumer consciousness when health is an emerging issue (re: diesel / air pollution).

World re-insurers, however, are ahead of us: Lloyds of London, Swiss Re, and others in their slipstream– having reviewed the precautionary evidence – now have an across-the-board EMF exclusion cause. When large insurers start to withdraw, toxicity gains serious recognition.

F) An ethical imperative: visible, transparent, infrastructure / embedding An ethical imperative is to make 5G transmitters or their housing visibly identifiable by the public. At present, each of you as British citizens have moderate means of managing your personal electromagnetic exposure: a means that will be increasingly valued and identified as a UN-convention-supported human right as health-awareness grows. Currently, you can sit at a remove from your wireless router/booster; you can move office if you are line-of-sight with a macrocell cluster, while testing your headache levels and productivity; you can decline a wireless smart-meter to reduce your exposure to the brief but relentless high-intensity microwave spikes (re: Professor David Carpenter et al). If you experience headaches, dizziness, ‘brain fog’, tachycardia or disorientation when surrounded by transmitting 4G phones, you can attempt to reduce your time in crowded locations.

However: if badly implemented, without moral forethought, 5G will remove all personal choice regarding exposure – at the very time when grassroots awareness of the need for this is accelerating. If, for example, you are pregnant and have read the latest peer-reviewed precautions on pulsed-RF foetal risks (e.g. damage to the hippocampus /

de novo genetic mutations /autistic and ADHD risk-factors) you will want to be able to identify embedded transmitters and to have access to clean spaces and to low transmitter-densities, both indoor and out, including clean train carriages or “white rooms”. For although you can put your phone in airplane mode or otherwise disable various outputs, you are dependent on moral digital policy for embedded 5G transparency – particularly in infrastructure/ facilities.

Equally, consumers (►inc. with implanted medical devices) will need to know how to disable embedded 5G output in products. Otherwise consumer choice, in e.g. irradiation of their person / dependents, is destroyed, impeding ethical progress.

Note: in ethical terms this issue has never been more pressing, given the perfect storm of small antennae (a feature of using higher frequencies) and the commercial temptation to bury these out of sight (without a clear locating label) plus any failures to map street transmitters and beam orientations publically – just when international precautionary calls are intensifying, and grassroots awareness is poised to take off: a global market-in-waiting for alternative connectivity and unpolluted homes/ offices/ classrooms/ green spaces etc.

G) An Invitation to Compare Two Futures This will take only a few minutes, followed by reflection. Rather than fear the growing weight of precautionary evidence (the several thousand papers on pulsed-RF toxic impacts – see end – and the great many coming down the tracks) and create an infrastructure review that timidly shies away from this, at risk of large downstream economic and human costs, let’s usefully imagine two contrasting futures.

i) Britain has successfully prioritised a 5G future that minimises pulsed-RF radiation exposure, nurturing and promoting alternatives at every opportunity. Embracing innovation in line with this, it has averted the new sick-building syndrome and other widespread, creeping deterioration that would otherwise result; productivity is high; national wellbeing is high; investors are attracted to Britain’s innovative, future-proof, low-radiation approach and the linked emerging health-first global market; telecoms interest in this new market is now positive and beginning to boom; consumers are enjoying the benefits of high-bandwidth fibre and easy instant hook-ups to their small screens; grassroots precautionary health awareness has inevitably grown exponentially, via social media and all other means; many now use state-of-the-art fibre for their main data traffic (the new “organic”) rather than self-irradiating devices; many also now have access to (independently health-tested / optically tested) less toxic two-way LiFi / VLC: its high reflectivity has reduced the need for indoor /outdoor pulsed RF (current WiFi/ DECT/ 4G and retrogressive RF 5G), it has also reduced the toxicity of public transport plus much mobile connectivity; mobile devices are more sensitive, needing less pollution to function; accommodation prioritising EMF hygiene is a boom business and

is awarded highly sought-after star ratings; rural ‘white zones’ and urban ‘white rooms’ have enabled the growing numbers of adults and children functionally disabled by pulsed-RF exposure (especially where still dense i.e. where lagging badly behind) to continue to access essential services and contribute to society; “digital detox” is a boom business and fibre classrooms attract educated, EMF-aware parents, inspiring wider reform; as in France, younger school-children are protected; bird, plant and vital pollinating-insect health has been preserved, to national benefit; pulsed-RF footprints are beginning to take their place in public awareness alongside carbon / plastic footprints: old-style wireless exposure, where people were drilled for hours by near-range pulsed microwaves/ mm-waves, is now seen as naive, outdated, and a heavy burden on health services / the public purse; GPs are more emf-aware and therefore more efficient; Britain is rightly proud of navigating its way to this inspiring digital future, ahead of competitors and less ethical nations.

(ii) Britain has buried its head in the sand and rolled out dense pulsed-RF 5G, recklessly filling every accessible human environment; IoT policy has shunned fibre/light-based/other pulsed-RF-reducing options, worsening pollution indoors and out; precautionary evidence is now even more mountainous and its neglect a towering crime against humanity; related cancer rates, neurodegenerative diseases, autism, blood-brain barrier damage, infertility, diabetes (from free radical damage to the pancreas), foetal neural harm, and cardiac effects from exposure (to name but a few of the downstream risks clearly signalled by the growing peer-reviewed evidence, below) continue to grow; although grassroots health awareness has grown despite unsupportive policies, it is refractory, and citizen talent that could have co-created a far healthier low-exposure Britain has lacked channels and been squandered; innovators awake to the new paradigm have emigrated; risks specific to 5G pulsed MMwaves (skin cancers, sweat-gland pain, further antibiotic resistance, free radical damage to leaves and pollinating insects etc., see above) have caused loss and suffering; functional disability from dense involuntary pulsed-RF exposure has rocketed and gone untreated, leading to misdiagnosis and squandered health resources, lost productivity, actionable gross neglect, and an increase in suicides; post-Brexit bargain-basement telecoms, where permitted, may have exacerbated this decline; visionary new-paradigm competitors who prioritise health are leaving us behind; Britain’s health related quality-of-life indicators have fallen, miring it in further social problems, public costs, and reduced revenue.

H) Educational published appeals by distinguished precautionary scientists Please each take a few minutes to read the texts, below, of the two major, public, scientist-led appeals, to date, calling for action to address escalating EMF exposures from wireless expansion.

i) The International EMF Scientists' Appeal

(Appeal statement to the U.N., signed to date by 240 scientists, peer-reviewed in the field, from 41 nations including the USA, China, Britain, Germany, France, Australia, India, and Russia:) "Numerous recent scientific publications have shown that EMF affects living organisms at levels well below most international and national guidelines. Effects include increased cancer risk, cellular stress, increase in harmful free radicals, genetic damages, structural and functional changes of the reproductive system, learning and memory deficits, neurological disorders, and negative impacts on general well-being in humans. Damage goes well beyond the human race, as there is growing evidence of harmful effects to both plant and animal life".

They warn "agencies setting safety standards have failed to impose sufficient guidelines to protect the general public, particularly children" and call for "leadership fostering the development of more protective EMF guidelines, encouraging precautionary measures, and educating the public about health risks, particularly risk to children and foetal development"

They call for doctor education, special protection for children/ pregnancy, the development of safer products, creation of white-zones (ie non-irradiated), independent funding and exposure of expert conflicts of interest, and the public to be taught harm-reduction strategies.

Addressing 5G, the conveners add: "There is scientific evidence to cause concern among independent scientists, that this new infrastructure, on top of existing electrical and wireless infrastructures, will cause more harm to mankind and nature. People who suffer from electrical sensitivity are facing the reality that they may have no place to go that is free from EMF hazards. We recommend that, in keeping with the U.N. Guiding Principles on Business and Human Rights, to 'Protect, Respect and Remedy', 5G technologies must be subjected to an independent health and safety assessment before they are launched.

ii) Precautionary Scientists and Doctors' Appeal on (wireless) 5G Health Risks

Flags important risks and calls for a European Moratorium on 5G pending independent research. Notice the Appeal's helpful alert on cumulative, involuntary exposure: "We the undersigned, more than 180 scientists and doctors from 35 countries, recommend a moratorium on the roll-out of the fifth generation, 5G, for telecommunication until potential hazards for human health and the environment have been fully investigated by scientists independent from industry. 5G will substantially increase exposure to radiofrequency electromagnetic fields (RF-EMF) on top of the 2G, 3G, 4G, Wi-Fi, etc. for telecommunications already in place. RF-EMF has been proven to be harmful for humans and the environment. 5G leads to massive increase of

mandatory exposure to wireless radiation" "5G technology is effective only over short distance...Many new antennas will be required and full-scale

implementation will result in antennas every 10 to 12 houses in urban areas, thus massively increasing mandatory exposure" The Appeal flags high involuntary exposure in homes, shops, and hospitals, greatly worsened by the billions of IoT emitters (i.e. the cumulative exposure, rather than low-power single sources, unless – my note - delivered by fibre/digital infrared etc etc.)

Germany was strongly represented: notice, therefore, that markets for safer infrastructure, products, and applications will be growing on our EU doorstep, as well as at home / overseas. Among other useful points, such as some published EMF disease risks, the Appeal also flags EHS (severe pulsed-RF intolerance / electro-sensitivity, sometimes extending to mains electric fields) as a "sentinel disease" for which inaction will come at a growing cost to society. It cites the UNESCO 2005 definition of the Precautionary Principle (UK-adopted, via the EU):

"When human activities may lead to morally unacceptable harm that is scientifically plausible but uncertain, actions shall be taken to avoid or diminish that harm." I suggest this definition applies to any digital rollout that fails to minimise involuntary pulsed-RF exposure by whatever means possible – even if this means re-conceiving 5G from the bottom up (while shedding loose safety assumptions based on the dying thermal paradigm) to deliver non-polluting, truly future-proof connectivity, in line with the powerful new paradigm.

►Update: see Professor Pall's important 90pp document on 5G biological risks EU 2018.

I) Hidden security & carbon costs; conserving wired infrastructure; fibre HAN To hope that wireless 5G will be truly secure is a fantasy. The proven hackability of some wireless-enabled implanted medical devices, for example, hints at the range of vulnerabilities and uncontrollable human costs of such colossal short-sightedness. There will always be brilliant, ingenious (or warped) wireless hackers who will enjoy the challenge of capturing, exploiting or selling wireless transmissions. Fibre is inherently more secure and therefore, I understand, often chosen for military facilities. Whenever you get an opening to prioritise fibre infrastructure and fibre add-ons, over wireless, remember that former CIA chief James Woolsey, speaking on air, identified wireless 'smart' grids as "a really, really, stupid idea".

One of the hidden carbon costs in buildings is their growing wireless output: ever-on WiFi routers, for example, were measured as one of the highest consumers in homes – a myopic trend exacerbated by marketing (for more powerful transmitters) to the uneducated. Factor in ever-on DECT and other growing pulsed-RF consumption, and

the pulsed-RF ‘smart’ home (packed with embedded transmitters) tends to becomes self-defeating. Add the grave prospect of living in / being permanently trapped in a dense, bio-active fug of pulsed electromagnetic fields – multi-source, cumulative RF exposures – and we have a new sick-building syndrome (with rising neurotoxic / cardio-toxic / carcinogenic / aging free-radical / sensitisation risks): a slow-burn disaster, not least to children, with hidden costs to the public purse.

Fortunately, fibre 5G can include fibre HAN – real-time appliance energy use that can be read over its wiring – together with many other fibre innovations that will attract talent, backing and further innovations, in a virtuous circle – providing that you are dynamic and develop attractive, world-leading, fibre-innovation policies. For inspiration and practical ways forward, and a no-nonsense exposé of 5G wireless fads, see the white paper Re-inventing Wires 2018 [► download], USA. See also: British bio-sustainability consultant / EU advisor Dr Isaac Jamieson.

Simultaneously, be alert for false claims of EMF hygiene. For example: i, dubious ‘health’ trackers and devices that rely on chronic pulsed irradiation of the body ii, phones/tablets failing to meet their SARS limit (radiation-absorption rate, woefully based only on 6-minute heating effects on a large male mannequin) iii, any ‘shield’ that directs output away from the screen only, with no mitigation of on-the-body exposure or passive exposure of other people.

J) New Paradigm: New Markets It’s good to end on an uplifting note. Perceptive observers will notice that evidence-based precautionary EMF health-awareness is growing steadily in peer-to-peer media, proliferating social sites, websites, and health-aware networks – not least among well-informed parents. From new health charities to (for example) Parents for Safe Technology, this movement crosses oceans and is very well represented in the English language, with growing ripple-effects and many helpful new memes, e.g. digital detox, moral technology, “sent from my wired device”, and so on.

On the whole, this is a power for good and portends where we are going: the rise in informed consumers who will want to service their digital consumption in ways that truly minimise both their and their family’s / peers’ RF exposure. A recent market response, for example (Far East), is the new “low radiation” WiFi router targeted at pregnant women.

Public rejection of 5G, based on non-consensual infrastructure and all the above health risks, has already taken California by storm: some three hundred towns and cities, plus numerous civil organisations and NGOs, filed rejections culminating in a 5G small-cell veto by the state governor. Witness as other states, other populations, gradually awaken, with wide ripple effects. Also notice several hundred French mayors’ rejection

of Linky smart meters: toxic stranded assets generating dirty electricity on house wiring – a risk of some switched-mode power aspects of 5G.

Can we learn from the precautionary advances in some other countries? President Macron stood on an election platform of mobile-phone exclusion from schools (to improve educational outcomes). South Korea has digital addiction clinics: recall the couple whose child starved to death while they raised a “virtual” child (Reuters). Cyprus is taking public education steps on reducing RF-EMF exposure; ►ditto (personal communication) some doctors’ surgeries in Russia. France’s new law “Electromagnetic Sobriety” includes ethical health and transparency measures such as labelling of public WiFi to enable EHS / the health-conscious to reduce their exposure.

Conclusion The coming cultural transition from naivety about electromagnetic toxic risks, including from 5G in its current reckless trajectory (from risks to our genetic material to functional disabilities and accelerated aging / chronic disease risks from the oxidative damage) towards electromagnetic maturity, which seeks far healthier ways forward, is to be supported and celebrated. This new paradigm is of a digitally but also biologically literate humanity, one that – from parents to infrastructure policy-makers, from home to nation – has wisely adjusted and guided its digital expansion so that it is less at war with our underlying biology and that of other life.

In terms of how our bodies, cells, and DNA function and signal, we are fundamentally bio-electromagnetic in nature: the exquisite extent of this is only now being uncovered. Artificial radiation that is less polluting of living tissue, such as digitally encoded light (or techniques to infill / soften the RF pulse) holds some promise, if independently fully bio-tested. Better still, well-managed fibre of every kind – perhaps barely visible to the human eye, shimmering with digital capacity – may remove EMF pollution in ways we have barely begun to imagine.

Your 5G-focussed future telecoms infrastructure review, plus 5G pilots review and review of connectivity on trains (see below) offers a golden opportunity to address escalating pulsed-RF pollution by backing safer, state-of-the-art digital applications as detailed above, and low-EMF zones, not least in sensitive habitats and child / welfare settings. So innovatively preparing the way to reduce pulsed-RF over-dependency and its cumulative risks as yet more precautionary evidence manifests, on top of the several thousand existing papers. In so doing, Britain will reap profound benefits over populations that rigidly cling to, and sink with, the dying paradigm.

I declare that I have no conflicts of interest.

Appendix 1) Some Ramifications for the '5G Network Deployment Pilots Review' Taking these insights in detail (A to J), both individually and as a whole, ramifications include:

1) the need for (independently funded) pre-testbed tests of the effects of any proposed forms of 5G using pulsed RF, including all new-use frequencies / mmwaves, on living cells and organisms. (Professor Martin Pall may be able to advise: he has thought through this area).

2) immediate stimuli and encouragement for non-pulsed-RF digital means: this may bring out feast of ethical innovation and technical creativity, translatable into pilots

3) independent pre-testbed LiFi testing on bio/optical effects, free of conflicts of interest

4) fibre pilots – pushing the boundaries on what can be achieved by fibre-to-fibre alone

5) following 3), light-based pilots, fully consensual and optician-scientist monitored, with adult volunteers

6) recorded informed consent from every individual or guardian in any test-bed area before piloting wireless (pulsed RF) in human environments (re: the Nuremberg Code)

7) small 5G pilots on closely monitored herbaceous habitat / insect habitat / beehives / bird populations /amphibians. Re: Balmori, 90% tadpole death 100m from phone masts (peer-reviewed); Everaert, nesting sparrow decline in phone mast radiation (ditto); decline of above-ground nesting pollinating insects in telecoms radiation (ditto, Lázaro 2016)

8) pilots that allow for /gauge bio- and health-effects from chronic, multi-source exposures

9) careful pilots on urban trees and species already under pressure. Re: Waldmann-Selsam et al 2016, tree damage up to 2 miles from phone masts, depending on exposure levels, consistently diagnosed by early thinning/ crown loss on the exposed side (peer-reviewed). (Dr Andrew Goldsworthy, formerly of Imperial College, has specialist expertise in this field which may be of service). For free-radical effects on fauna/flora, see Prof C Georgiou.

Appendix 2) Some Ramifications for the 'Commercial Options for Delivering Mobile

Connectivity on Trains Review' In particular, see D: the need for provision of a protected space on each train service that will preserve access and equal rights /essential human rights for pulsed-RF intolerant/impaired adults and children, as well as all future consumers who wish to limit their RF-EMF exposure, including in pregnancy. This could be the "quiet carriage" or a simply-shielded vestibule, at negligible cost, especially when compared to the investment and adaptation that is made for other differently-abled groups such as the partially sighted and mobility-impaired, in line with the 2010

Equalities Act.

Endnote

For accessible, independent-scientist / scholarly overviews of the several thousand papers on the chronic disease / dysregulatory and other emerging risks of RF-EMFs, see:

● Research summaries by Professor Henry Lai: he is widely respected for probing beyond published

abstracts and combing innumerable papers in conscientious, even-handed, detail

● Michael Bevington, Electrosensitivity and Electro-hypersensitivity, 2014 (denoting life's inherent sensitivity to EMFs), a scholarly to me with comprehensive, thematic, research listings.

● For telecoms infrastructure ethics, see the major Harvard Ethics Report Captured Agency by visiting professor Norm Alster; for an enjoyable and insightful introduction, see Overpowered by Professor Martin Blank.

● If needed, further resources / specific themes can be emailed)

Thank you

* The old paradigm on which pulsed-wireless telecoms was first built is fading (this is not to be feared since telecoms firms will profit in time, with innovation and, e.g., their fibre investments). In truth, it has been dying by stages ever since its inception. This is the 1950s-origin hypothesis that artificial non-ionising radiation causes harm (later diluted to 'significant' harm) only at very high power densities, known as "thermal levels", that are capable of heating/frying living tissue. Military research (Russia / USA) rapidly unravelled this, and uncovered, for example, from non-heating exposures:

►disabling microwave sickness or 'radio sickness' in military personnel

►chronic risks to the Central Nervous System, fertility, foetuses, genetic material, etc.

►*the ability to induce different types of psychosis using a wide range of pulse modulations nb wireless digital output is pulse-modulated or "pulsed" and uses the same portion of the spectrum / some identical frequencies to the above; pulsed RF is more bioactive than continuous waves*