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Sustainability in the delivery of Outside Broadcasts - The road to carbon zero and why it isn't remote

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ABSTRACT

The need to move towards zero carbon business practices is an imperative for all industries in order to mitigate the effects of climate change. The correct and most elegant solution can only be achieved by understanding the problem and then implementing the most sustainable methods to achieve the greatest impact.

This paper explores the use of remote production techniques within television production and concludes that it is not the best approach in the stated goal of a reduction or elimination of carbon emissions, whilst at the same time maintaining the highest editorial, production and technical standards in the outside broadcast production of live events.

INTRODUCTION

The last 10 years has seen a steady move to investigate and implement remote production as a new way of delivering outside broadcasts. Perceived originally as a more cost-effective form of production, the transition has been accelerated by a need to create physical distance through the 2020-22 global covid-19 pandemic, where traditional technical standards have been abandoned in a race to keep television on air.

With the increase of understanding in the western world of the need to tackle climate change, as is highlighted by the move to electric vehicles encouraged at a governmental level 'DfT (1)', the justification for remote production has shifted once again from cost saving, to social distancing and now to carbon reduction.

In this never-ending march to make the Emperor's new clothes, it is entirely possible that the real benefits of remote production are being oversold to the detriment of the newly appointed goal of carbon reduction and that a new approach, which is developed from the ground up to solve the problem, is needed. This paper explores this idea, with key insights as to how best to approach the need to reduce the carbon footprint of outside broadcast television productions.



THE PROBLEM

Assuming that this paper is primarily concerned with the role of remote production in the battle against climate change, it is first important to understand the scale of the problem. In a 2020 article 'Ritchie et al, (2)', it has been stated that the world is emitting over 34 billion tonnes of CO₂ a year. At the end of WWII, this was 4.24 billion tonnes; 1975 (this author's date of birth), it was 17.05 billion tonnes, right up to the present day at 34.01 billion tonnes.



Figure 1 – The perceived problem?

NASA's measurement (March 2022) 'NASA, (3)' states that the current concentration of CO₂ in the atmosphere is 417ppm, a rise of 50% from the beginning of the industrial era in 1750. As stated in 'Irreversible climate change due to carbon dioxide emissions', 'Solomon et al, (4)', the temperature rises modelled by countless scientists are not expected to reduce, even if all carbon emissions ceased. In fact, the same article predicts that the concentration in the atmosphere will peak at 1200ppm, after which it will come down to 800ppm by the year 3000 if all emissions were to cease after the peak, nearly twice the concentration now. This is predicted to cause a 4 degree surface warming over the same time period, with that warming stabilising, but not reducing by any significant amount, even with the ceasing of global emissions.

This is code red.

It is not within the remit of this paper to prove or disprove the case for climate change, however the facts are stark, and the effects are already being seen in multiple geographical locations around the world. What is in discussion however is the role that television production can play in shifting the attitudes towards climate change, and in particular the mechanisms to counter that climate change, especially moves to reduce the emission of carbon which is accepted as a key driver in global warming. It is this change in *attitude* that is all important.

Whilst the actual reduction in carbon emissions caused by television production will be a small drop in a very large ocean of causality, the industry finds itself in a disproportionately fortunate and influential position of being able to change wider attitudes to the problem and have a much greater influence over the destination of this journey.

With a global focus on the events that this industry is fortunate enough to cover, from World Cups to Olympic Games, the changes made in event production can resonate to a global audience, so it is entirely right that companies like Sky should lead the way to net zero by 2030 'Sky, 2022 (5)'.



THE PERCEIVED SOLUTION

Sky is leading the charge to net zero and leveraging its position as a leading broadcaster to change attitudes on a global scale to the problem at hand. In conjunction with Tottenham Hotspur, the company created a case study based on an English Premier League (EPL) match on the 19th September 2021. The subsequent write up 'Sky, 2022 (6)' details how a net zero football match was estimated to have been achieved.



Figure 2 – Sky's well publicised commitment to net zero

As stated in the article, it was impossible to prevent all emissions, so offsetting was used where emissions couldn't be eliminated. With the focus of this paper being on television production, it is worth noting that the estimated reduction in emissions from the production of the event was 70% from a baseline established from the same event in 2019.

This was partly achieved through the use of remote production. However, as alluded to in the introduction, remote production is a *solution looking for a problem*, with it first being lauded as a way of reducing costs in television production. It has been proposed that having a central production facility allows production costs to be reduced by preventing journeys by production staff (with the resulting reduction in hotels and expenses), as well as by using that same production facility multiple times a day on different productions.

However, in many cases this is based upon flawed assumptions:

- A reduction in travel and a central focus

Assuming travel to be a problem in terms of both the commercial and carbon cost, it is indeed attractive to find a way of reducing the amount of travel that takes place. For key production personnel who are based in a central location, e.g., London, the benefits of going to the normal place of work are obvious, with most people living in a commutable distance of their workplace. In fact, it is usually the responsibility of the individual to make their way to work, not that of the employer, whereas going to site becomes the responsibility of the broadcaster or production company, hence incurring the commercial costs of getting to the venue.

In carbon terms this becomes more problematic. The mitigation of scope 3 emissions 'Carbon Trust, (7)' include not only business travel but also employee commutes. Therefore, whilst remote production may indeed be attractive for the commercial benefits of mitigating travel, the need to consider travel to *any* place of work in scope 3 makes working at a central location slightly less attractive in carbon terms.

For television production there are also compounding factors. Many of the very best television professionals are based all over the UK, after years of travelling to locations around the country. This is likely to be the case in other territories as well. The very best engineers, EVS and camera operators, amongst many other professionals, live in various areas of the country due to decades of travelling to venues to be 'at the event'. In fact, the EPL has led the way in creating a national product that has encouraged travel to games,

both home and away. Even the pundits used for many of these productions have settled in many diverse locations based on their playing careers. Furthermore, there has been a decades long programme by successive administrations in the UK to encourage geographical mobility through access to higher education, enabling a levelling up in regions across the UK.

The Institute for Fiscal Studies in its article, “London calling? Higher education, geographical mobility and early-career earnings”, ‘Britton et al, 2021 (8)’ stated that by age 27 35% of graduates and 15% of non-graduates have moved away from the Travel To Work Area (TTWA) in which they lived at age 16. This finding shows that people in receipt of higher education often use that education to move to other areas which in turn distributes talent across the country. In fact, this author relocated from the UK’s home counties to Manchester for University studies and subsequently settled in the midlands. Cloudbass is a high technology business based in a former mining community as a result. It therefore seems nonsensical to be encouraging a system of television production that further encourages a focus on London and the home counties.

In carbon terms, the travel of the current crop of television professionals to a southern location to work on the highest profile remote productions, means that there is actually an *increase* in CO₂ production associated with a given event than if they were to attend a site nearer their town of residence. Whilst the established system of ‘buy out’ rates for freelancers means that commercially this is not of concern to the broadcaster or production company, scope 3 will quickly expose the carbon cost of such methods of production.

- No desire to be at the event

High level television productions naturally follow the highest-level events, as it is the role of television to expand the reach of that event to a wider audience. The desire to be at ‘the big event’ has long been a key driver in the career of this author and in turn has led to the creation of the UK’s third largest and largest independent outside broadcast facilities provider from a standing start in less than 20 years, within the context of a well-established marketplace. This has been driven by being at the very best events, from Olympic Opening Ceremonies through Ashes test match series’, to being sat just in front of the stage watching a briefly reunited Pink Floyd at Live8.

The biggest events that demand the presence of television are naturally the events that an audience wants to be at. It is nonsensical to think that the very professionals employed to convey these events to a global audience don’t themselves want to be at the event to soak up the atmosphere and be immersed in all that is happening on site. Working in an office suite in an industrial estate is often the very environment that a television professional has spent their life trying to avoid and if remote production is the future method of operation, then the brain drain from the industry could be significant.



Figure 3 – The author on the night of the 2012 Olympic Opening Ceremony



- Use of facilities multiple times

There is a common misconception that a broadcast facility can be used multiple times if working to several remote productions. This may indeed be the case in a limited number of circumstances, if the switch from one event to another can be made quickly and seamlessly without any risk to the production and assuming that an individual production doesn't need those facilities for pre or postproduction.

However, there is also a flip side to this. Television production is not like car production. There doesn't need to be a constant flow in the same way that Model 3's need to keep rolling off the Tesla production line. As the audience moves from work to leisure, the events and their coverage naturally ebbs and flows. The facilities needed at any given moment goes through peaks and troughs in demand and it is highly possible that valuable galleries are either over or under used. Those galleries are then housed in office buildings that, without proper management, can then be an energy sink through heating, cooling, or the desire to keep them running to ease the burden of bringing a complicated facility back online from a cold start.

An outside broadcast truck, by its very nature, is only powered for the period it is in use. Only the exact amount of energy needed for heating, cooling and for the equipment is used for the production it is assigned to with just the right amount of space being deployed for the production personnel. For the rest of the time, it is parked up in a garage, not consuming any resources or emitting any carbon.

- Commercial / Carbon cost reduction

The mitigation of travel in commercial terms is attractive to television producers, however in carbon terms it is less so. Even the commercial benefits need to be weighed against the extra costs of producing the coverage in a remote model, from the connectivity required to the extra engineering support needed to ensure that both event and remote locations are supported, and that the production runs smoothly. It is quite often the case that unless the potential savings are significant, e.g. in a case where substantial foreign travel may be involved, the extra costs incurred quickly overshadow the benefits.

Within most outside broadcast funding models, the truck is often the cheapest element relative to its cost and the return on investment is low. They are often used as a gateway to the hiring of cameras, lenses and VT systems so broadcasters are actually undergoing significant capital expenditure to replace something that they were previously getting a very good deal on through operational expenditure which could be costed per production.

Furthermore, the risk to the production also needs to be factored in. Whilst the use of broadcast networks, at great cost, provides some sense of comfort in the deployment of remote production workflows, there will always be an element that is out of the direct control of the production company, broadcaster, or facilities provider.

Cloudbass was involved in the move to the very earliest remote productions in the EPL through providing on site facilities for foreign broadcasters at over 250 matches a year on behalf of IMG. One of the customers who had a bespoke offering was NBC who in turn deliver the EPL to a US audience. On one particular day, connectivity was severed by someone cutting through a cable on the Jersey turnpike during roadworks. The reversion



to satellite was swift and saved the production on that day.

Delivery overseas for a product with well-established connectivity at grounds that are used numerous times a season is probably the very best commercial and carbon case for remote production, however such use cases make up a fraction of the television production undertaken on any given day. Is it really worth incurring the commercial and carbon costs to cover events remotely on an island where the vast majority are within a 2-hour drive from a central base?

A NEW WAY

There is an often-paraphrased story of a tourist asking directions of a knowing passer-by, who replied by saying:

'If you are going there, I wouldn't start from here.'

A recent successful response to a BBC Sport Request for Proposal (RFP) was met by the Cloudbass commercial team with the usual frustrations at the need to *tick the boxes* for the sustainability section of the proposal. However, led by the knowledge gained through the newly implemented Electric Vehicle scheme at the company, there was a desire to start from the ground up in the approach to the problem of carbon control.

At the time of writing, over 19 tonnes of CO₂ have not been emitted by employees of the company through the use of electric vehicles and yet at a recent SVG event discussion, Football Summit 2022: Green is the colour, football is the game, hosted by Tottenham Hotspur FC on the 10/3/22, there was not a single mention of electric vehicles as a means to mitigate the emission of carbon. The industry seems to be further doubling down on this approach with the upcoming (at time of writing) discussion at the Media Technology and Production Show entitled, 'How Sports Broadcasting is Driving Sustainable Change Through Tech' which is focussed almost exclusively on remote production.

Frustrated by the direction of travel of the industry and in response to the need to take a lead in sustainable production, both in response to the BBC Sport RFP and as an ongoing delivery partner for Sky Sports, Cloudbass has developed the 'Cloudbass Outside Broadcast Carbon Calculator' (CBOB CC) to easily and simply identify where the carbon is being emitted on a traditional outside broadcast.

This simple spreadsheet is designed to be used by the back office, to be able to quantify how much carbon is emitted through the supply of facilities to a given production. Key to the approach is not to focus on the accuracy of an individual case, although it needs to be reasonably accurate, but rather to focus on the changes that can be made. Committing to tracking the carbon emissions of each job by the end of 2022 will allow the necessary changes to be implemented and the reduction in emissions to be successfully tracked.

The spreadsheet makes several key assumptions:

a) The burning of diesel is a fixed contribution

It is taken that the burning of diesel, in any situation, results in a contribution of 2.62kg of CO₂ emitted per litre of diesel burned. 'CommercialFleet.Org, 2022. (9)'

This measure has also been seen in other sources and seems to be an effective measure of the contribution of burning diesel. As it is the progress that is being tracked, the number used doesn't need to be exact, yet this number seems to be prevalent enough to be relevant.

b) The efficiencies of engines are effectively recorded

It would be practically impossible to map the exact emissions of each vehicle for a given outside broadcast, yet it is essential that the CBOB CC is quick and easy to use to ensure its continued use in keeping a record of contribution. Therefore, a realistic figure for each vehicle class is used based on available data. The vehicle performance is based on miles per gallon and should provide a reasonable estimate of CO₂ produced based on the diesel burnt. If more accuracy is required, then additional vehicle classes can be added. Generator performance is taken from the relevant data sheets.

c) The contribution of HVO

Cloudbass was the first facilities company in the UK to adopt HVO fuel for both its generator and road fleet and powered the first UK OB with HVO for Sky Sports. This fuel has a published equivalent CO₂ reduction of 90% compared to standard diesel. This is by taking in to account the full lifecycle of the fuel. Within this model a more conservative 75% measure is used so as not to overstate the importance of HVO.

Cloudbass is unique amongst its contemporaries in having its own fuel bowser on site which means that the company receives bulk deliveries of diesel. Using the same delivery practices as competitors immediately results in a carbon saving based on the use of HVO as road diesel, a fuel that isn't widely available on the forecourt.

d) An average mileage

Whilst it is possible to map the exact mileage for each event, this would be time consuming and prevent the wider adoption of the CBOB CC. Therefore, an average mileage is used for the events. It would be possible to provide more accurate data, however it is the progress that is important rather than the individual accuracy of each record.

e) Limitations

It is understood that there is a carbon cost to the generation of electricity however for the purposes of the CBOB CC only the tailpipe emissions are being considered. It is also assumed that renewable sources of electricity are being used, which also have a carbon cost albeit at much lower level. The carbon cost of the production of fossil fuels is not considered, so neither is the generation of electricity.

In fact, the World Nuclear Association 'WNA, (10)' states that the tonnes of CO₂e per GWh produced for coal is 888 compared to 26 for wind power. Electricity generated by wind would result in 11g of CO₂ per mile for EVs. Taking in to account the well to tank CO₂e for diesel would add another 47% in CO₂ emissions, or 106g, as discussed in 'Producing gasoline and diesel emits more CO₂ than we thought', 'Hoekstra, (11)'. The difference is so stark that trying to over emphasise it is largely negated by its difference.

With the CBOB CC it has been possible to easily calculate the impact of the facilities on each production. For the purposes of the response to the BBC Sport RFP, a traditional 10 camera with no HVO (a bio diesel) OB was modelled:

10 Camera OB - Non HVO
Large Scanner / Tender /
Twinset Generator

NON HVO CBOB

Crew 34

No electric vehicles

Average Mileage to site 100

Average Freelance Mileage to

Site 100

Emitter	Quantity / Hours	Vehicle Class	CO ₂ or CO ₂ e (kg / mile)	Note	CO ₂ (kg)
Scanner	1	7	1.08		216.53
VT Truck	0	13	0.25		0.00
Tender	1	5	0.99		198.48
Generator	1	11	0.25		49.62
Staff Vehicles	7	8	0.07	2+:1 ratio	104.20
Staff Vehicles	0	15	0.00	Electric	0.00
Freelance Vehicles	22	1	0.30	1:1 ratio	1310.00
Freelance Vehicles	0	15	0.00	Electric	0.00
Freelance Vehicles	1	2	0.40	Steadicam	79.39
Freelance Vehicles	1	3	0.52	Security	103.56
Generator (rig)	1	22	65.50		65.50
Generator (TX)	1	23	87.51		87.51
				TOTAL	2214.80

Figure 4 – The calculated carbon output for a traditional 10 camera OB with no mitigation

A calculated output of 2.2 tonnes of CO₂ would seem reasonable and is in line with Sky’s own calculation of 4.1 tonnes for the 2019 Tottenham Hotspur coverage ‘Sky, 2022 (6)’ which considered all emissions from a much larger production and includes production personnel as well as technical. The Sky baseline analysis was supported by carbon accounting specialists RSK, which clearly can’t be undertaken for the hundreds of productions a year serviced by a broadcast facilities company, therefore a simple method is needed which the CBOB CC provides, yet still results in sufficiently accurate results.

What the output of the calculator shows is most of the carbon emissions are created by freelance and staff vehicles, as well as power generation – over 74%.

Running the numbers through the CBOB CC again but with shore power, HVO and electric vehicle use (renewable electricity supply) creates some interesting numbers:

10 Camera OB - HVO + Electric
 Scanner / Shore Power with UPS genset backup / Electric crew vehicles
 HVO CBOB + Electric
 Crew 34
 No electric vehicles
 Average Mileage to site 100
 Average Freelance Mileage to Site 100

Emitter	Quantity / Hours	Vehicle Class	CO ₂ or CO ₂ e (kg / mile)	Note	CO ₂ (kg)
Scanner	1	14	0.27		54.13
VT Truck	0	13	0.25		0.00
Tender	1	12	0.27		54.13
Generator	0	11	0.25		0.00
Staff Vehicles	0	8	0.07	2+:1 ratio	0.00
Staff Vehicles	7	15	0.00	Electric	0.00
Freelance Vehicles	0	1	0.30	1:1 ratio	0.00
Freelance Vehicles	22	15	0.00	Electric	0.00
Freelance Vehicles	1	2	0.40	Steadicam	79.39
Freelance Vehicles	1	3	0.52	Security	103.56
Generator (rig)	0	22	65.50		0.00
Generator (TX)	0	23	87.51		0.00
				TOTAL	291.22

Immediate reduction:



Figure 5 – The calculated carbon output for a traditional 10 camera OB with easily and immediately achievable mitigation

A reduction of over **nearly 2 tonnes** of CO₂ per OB.

These reductions can be achieved through measures that are easily implemented using practices already employed by facilities companies and the move to EV transport will drastically reduce emissions. These emissions would be generated no matter where the production is being completed.



These changes are stark. A reduction of over 86% through very simple measures. This contrasts with the published figure of a 70% reduction in CO₂ emissions from the Tottenham Hotspur game, which was achieved through remote production. It is unclear if the scope 3 emissions have been taken into account in the Sky modelling, however all travel of technical personnel has been calculated above and not one person has worked off site. All of the production personnel would only require personal transport, so taking into account both technical and production personnel would not increase the output above and everyone could be on site for the big event.

Is it time for the industry to look at this problem from a new angle?

In order to achieve this change, there are several things to note:

- Universal adoption of EVs for personal transport

This approach relies on the need for all people transport to be in electric vehicles which are fuelled entirely by renewable electricity. It is a diminishing misconception that electric vehicles are 'not there yet' and that they are not suitable for life on the road, as is the case in outside broadcast television production. This simply isn't the case. It is the experience of the author that a Tesla Model 3 provides the perfect transportation platform having completed 18,000 miles in less than nine months, including a trip to the Alps. Taking in to account the fact that all electricity used was renewable (including all Tesla Superchargers), this is a saving of over 4 tonnes of CO₂ compared to a typical diesel BMW 3 series.

Given that 'CO₂ and Greenhouse Gas Emissions', 'Ritchie et al, (2)' estimates that the per capita emissions of a UK resident is 4.85 tonnes of CO₂, it is conceivable that as a high user of transport miles, the author has already mitigated over 50% of annual per capita emissions compared to the average UK mileage of 6607 miles for 2019 'Department of Transport (12)', especially taking in to account the emissions not emitted by travel to the Alps for a skiing holiday.

Furthermore, it highlights the confusion in approach to carbon control taken by the television industry. The approach employed at the Tottenham Hotspur net zero game in 2021 was to remove production from site, yet the travel to site for fans was still accepted, however they were encouraged to find environmentally friendly modes of transport. The natural extension of the approach taken by the television industry is for everyone to enjoy the game remotely, yet by contrast if television production took the approach of the fans, then the result would be as per the CBOB CC results.

- No single person taken off site

Taking the approach above, supported by the numbers calculated, results in no person having to come not attend the event. This in turn results in a traditional method of production which has all of the editorial and technical benefits that has served large and small scale productions for many years. There is clearly a threshold where the amount of travel involved and the resulting work / life balance considerations start to come to light which could then justify a remote production model, however in a territory like the UK these are few and far between.

Removing the carbon problem makes the above methodology appealing.

- A move to sustainable power models

It is essential that TV production moves to sustainable power models. Switching to shore power with UPS and emergency diesel back up can result in better technical power outcomes than traditional twinset diesel generators.

Cloudbass has already implemented this as part of its BBC Alba coverage of the Scottish Professional Football League (SPFL) on behalf of Nemeton TV. A Sprinter van technical scanner with full UPS backup, with no HVO use or EV travel has resulted in the following changes (as calculated with the CBOB CC):

Incumbent provider  Current (year 2)
1766 kg 762 kg

There are approximately 30 events of this specification per year, each now benefitting from one tonne of reduction. There are a similar number of events with a larger specification, but still using the same delivery principles. It should be noted that this is without the contribution of HVO, as these events are serviced by Cloudbass’ regional Scottish base where there is no fuel bowser available to store HVO.

These reductions have been achieved through:

- Smaller, van-based facilities which are driven to site by engineering crew
- Shore power. Cloudbass worked with the SPFL to install 63A three phase supplies in all grounds
- Full UPS backed up facilities so a switch to generator power can be made within 15min of an outage with no loss of capability



Figure 6 – Effective technical and production partnerships in tackling the problem of carbon emissions can result in impressive results

The implementation of 63A three phase supplies in SPFL grounds will allow Cloudbass to transition Sky to a shore power model sometime in the 2022/23 season. This will take place on a much larger SPFL production, using large scale UPS back-up solutions suitable for traditional outside broadcast expanding scanners.

- We can get to zero

The CBOB CC highlights where the remaining emissions lie. A move to sustainable modes of transport for larger goods, in this case the trucks, Steadicam and security camper vans, is one that is harder to achieve. The move to sustainable transport is a global problem and is not within the remit of television industry. HGVs in the UK represent 5% of miles travelled on UK roads, yet emit 16% of the CO₂ ‘DfT, 2021. (13)’. Nearly every item around a person at any given time has likely made a journey on an HGV or LGV at some point. This is a problem that will be solved, and soon.



Tesla said that they would release their all-electric tractor unit in 2017, yet have delayed its release as they are concentrating on car production first. Within the next 5 years it is almost certain that a battery electric or hydrogen tractor unit will become available as the commercial and carbon savings will be significant. When this happens the remaining CO₂ of onsite production will be eliminated.

Television production in the UK is the perfect use case for such vehicles as they are often parked for long periods in industrial bases with good sources of electricity (Cloudbass' electricity supply is 100% renewable). They then make a journey that is likely to be possible on a single charge (Tesla estimate a 500mile range for its tractor unit), before being parked up again for several days onsite, allowing charge to be replenished.

Furthermore, the commercial benefits of a switch to such tractor units make it attractive to do immediately, no matter where the organisation is in the lifecycle of existing diesel tractor units.

CONCLUSIONS

The move to sustainable business practices is essential in all industries in order to combat the effects of climate change. For some reason in television production this need to reduce carbon output has been confused with a move to remote production which is clearly a solution looking for a problem, first commercial, then covid and now carbon. It has possibly only been successful in the prevention of virus spread, yet now seems to be hailed as the golden bullet for carbon reduction.

With television playing a role of influence in the behaviour of the wider audience rather than being able to make a meaningful impact by changing its own behaviour, the approach taken is more important than the changes made in real terms, so getting the approach right is vital. The messaging is currently confused as by signalling a change to remote working the industry is advocating a stay-at-home approach, yet in the case of one of the most popular sports properties, in this case the EPL, the message to fans is that it is still ok to travel but in a different way. This mixed message could potentially be harmful.

By viewing the problem from a different angle and by utilising emerging technologies that are relevant to society as a whole, a new approach is not only more effective but also less disruptive to the well-established workflows of onsite production developed over decades of television coverage. The lead taken by large broadcasters may have not landed upon the most effective solutions to the problem, however the very nature of their efforts has led to a shift in the conversation as is evidenced by this paper, which is surely a far better outcome than the emissions mitigation on single production.

In the quest to remove carbon from television production, the answer may indeed not be remote production. Hopefully the world will avoid another global pandemic and that particular method of on outside broadcast production will just become one of the many tools that the industry uses, rather than the perceived answer to all of the industry's problems.

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