Submission on Victoria's Gas Substitution Roadmap Consultation Paper

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Introduction

Doctors for the Environment Australia (DEA) is an independent, non-government, voluntary organisation of medical doctors and students in all Australian States and Territories.

Our members work across all specialties in community, hospital, and private practice to prevent and address the diseases – local, national, and global – caused by damage to our natural environment. We are a public health voice in the sphere of environmental health with a primary focus on the harms to health from pollution and climate change.

DEA welcomes the opportunity to contribute to Victoria's Gas Substitution Roadmap Consultation Paper[1] which will establish details and timelines for Victoria's Climate Change Strategy,[2] released in May 2021.

Crucial to this strategy is the intention to meet specific emission reduction targets (ERTs) of 28-33 per cent by 2025, 45-50 per cent by 2030 and net-zero by 2050. The Victorian government is to be commended for creating these targets, which, although necessary to compensate for lack of a federal plan,[3] may not be commensurate with the desired limitation of warming to less than 2˚C as outlined by the IPCC. The Paris Agreement is very explicit in its purpose: "……. to hold the increase in the global average temperature to well below 2°C above pre-industrial levels and pursuing efforts to limit the temperature increase to 1.5°C above pre-industrial levels, recognizing that this would significantly reduce the risks and impacts of climate change".[4] With a mean warming of 2˚C and above, the adverse health effects of global warming are likely to be severe.[5] Many regions world-wide and even in Victoria could become unproductive and uninhabitable.

Summary

Doctors for the Environment Australia is fully supportive of the Victorian government's intention to devise pathways (a Roadmap) to enable its emissions reductions to be met. We have confined our comments to the six Key Pathways identified to address the carbon impact of gas in Victoria, and how this impact can be minimised to allow the Roadmap to be developed.

1. Ensuring energy efficiency of the built environment is an essential aim, particularly with the anticipated progression of climate change. There are a number of measures which can easily be deployed in a cost-effective manner, with an increase in minimal residential energy rating being crucial to energy and cost savings.
2. Transferring reliance on energy from gas to electricity is now cost-effective because of new technologies. All-electric households fed by renewable energy will substantially reduce demand for gas and increase the likelihood of meeting emissions targets. Withdrawal of gas will also remove the risks to health of gas combustion in poorly ventilated settings. Gas reticulation to new housing developments should not be mandatory. There should be no new gas installations or upgrades in Australian hospitals from 2021.
3. Methane ("natural") gas will still be required for some industrial processes but with rapid developments in firming by renewable energy, there may be little need for gas-powered peaking generation. Plastics re-cycling can largely circumvent the need for gas mining to obtain ethane for new plastics manufacture.

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[1] https://s3.ap-southeast-2.amazonaws.com/hdp.au.prod.app.vic-engage.files/2816/2440/7286/Victorias_Gas_Substitution_Roadmap_Consultation_Paper.pdf

[2] https://www.climatechange.vic.gov.au/__data/assets/pdf_file/0025/522169/Victoria-Climate-Change-Strategy-Accessible.pdf

[3] https://s3.amazonaws.com/sustainabledevelopment.report/2021/2021-sustainable-development-report.pdf

[4] https://www.ipcc.ch/sr15/

[5] https://www.dea.org.au/wp-content/uploads/2017/02/DEA_Climate_Change__Health_Fact_Sheet_final.pdf

There is enormous potential for hydrogen as a clean source of energy and as a clean fuel bank. Time and funds devoted to production of hydrogen from Victoria's brown coal is fraught with risk as economic carbon capture and storage at the scale required has defied industrial technology for decades.

4. Biogas and biomethane have limitations due to their sources and production methods and are probably only suited to small-scale local operations.
5. New and emerging technologies are the backbone of the transition away from methane gas. There are multiple technologies available to enhance supply, affordability, and reliability of renewable energy. It is important that these advances are not suppressed by adherence to carbon-emitting methods. Heat-pump technology is transforming household heating and cooling while electrical cooktops and appliances can replace gas for cooking. Community-based power projects can provide support for those with limited access to renewable energy.
6. Fugitive emissions of methane from all gas mining and delivery operations continue to be a major problem and may well prevent carbon reduction measures from solving climate change. This possibility alone is sufficient to seek cessation of all gas mining.

PROBLEMS OF GAS AS A TRANSITION FUEL

Methane has been suggested as a transition fuel to enable gradual withdrawal from current heavy reliance on products from oil refining, and coal combustion. This transition period is necessary because of the imbalance between the uptake of wind and solar energy and delay in development of energy storage systems and distribution networks. However, gas is not an ideal substitution fuel for several reasons.

1. Methane and liquefied natural gas (LNG), when considering the full energy life-cycle from extraction to combustion, including flaring, liquefaction and transport, plus fugitive emissions, produce equivalent greenhouse gas (GHG) emissions to coal-fired power generation.[6,7]
   The concentration of atmospheric methane continues to rise such that methane now contributes nearly 20% of the greenhouse effect[8] and a recent study suggests that the anthropogenic contributions have been underestimated by 25-40%.[9] Therefore, continuing the utilization of gas will make it difficult for Victoria to honour its interim emission reduction targets and its recently announced Climate Change Strategy.
2. The use of gas inside the home is associated with adverse health effects which are often ignored.[10] Domestic heating and cooking with gas equipment create toxic products similar to those from burning other fossil fuels including particulate matter, oxides of nitrogen and sulphur, and volatile organic compounds, all of which contribute to respiratory conditions and heart disease.[11] One recent Australian comparative risk assessment study has shown that 12% of childhood asthma is associated with the household use of gas stoves.[12] In addition, the burning of gas creates carbon monoxide, the

[6] https://ieefa.org/wp-content/uploads/2020/03/Is-the-Gas-Industry-Facing-its-Volkswagen-Moment_March-2020.pdf

[7] https://ieefa.org/wp-content/uploads/2020/06/Gas-Cannot-Stimulate-the-Economy-Reduce-Emissions-or-Provide-Cheap-Power_June-2020.pdf

[8] https://theprint.in/environment/why-methane-is-a-far-more-dangerous-greenhouse-gas-than-carbon-dioxide/378858/

[9] https://www.nature.com/articles/s41586-020-1991-8

[10] https://www.climatecouncil.org.au/wp-content/uploads/2021/05/Kicking-the-Gas-Habit-How-Gas-is-Harming-our-Health.pdf

[11] https://doi.org/10.1289/ehp.1002186 https://doi.org/10.1186/s12940-016-0207-z

[12] https://doi.org/10.5694/mja17.00469

adverse cerebral effects of which are often undetected,[13] though these adverse effects can be prevented by the use of adequate ventilation and exhaust fans. Somewhat paradoxically, in modern homes which are thoroughly insulated from draughts, exhaust fans above gas-cookers may create negative pressure leading to retention of combustion products within the home.

There are similar potential hazards with un-flued and open-flued gas room heaters. While un-flued gas heaters are now banned, open-flued heaters are still being installed as replacements for older models.[14]

Even with appropriate education of consumers, the risks associated with indoor gas use cannot be eliminated. This is evidenced by the fact that multiple state government departments have released public educational material about the health and safety issues of burning gas indoors, yet illness and fatalities from carbon monoxide poisoning continue to occur.[15]

THE SIX PATHWAYS TO ADDRESSING THE CARBON IMPACT OF GAS IN VICTORIA

DEA fully supports the Victorian government in its endeavour to minimise the carbon impact of gas. The thrust of our submission will be to highlight the development of approaches which allow minimisation of gas during transition while not threatening the supply, affordability, and reliability of energy for Victoria. Comments will focus on the six emerging key pathways to addressing the carbon impact of gas in Victoria as outlined in the Consultation Paper.

1. Energy efficiency

Improving energy efficiency in the built environment is vital to future gas minimization as heat waves and higher average temperatures are predicted with climate change,[16] while winter-times will still require indoor heating. Excessive heat has been identified as a major health hazard and has resulted in several hundred recorded extra deaths in the last decade in Australia, but the true number may be many times greater.[17] If recent record high temperatures which contributed to scores of extra deaths in the northern hemisphere summer of 2021 are any indication,[18] areas in northern Victoria may well become unliveable in summer.

Energy efficiency has long been sub-standard, particularly considering the range of weather already experienced in Victoria. For residential buildings, the current requirement of a 6-star rating is recognized as being inadequate. Momentum is increasing for a more stringent standard of 7.5 stars. which should not be difficult to achieve given the availability of new materials and construction methods. Attention must be given to building design in relation to geographic orientation to capture winter sun and minimise summer exposure. The need for adequate eaves should be re-examined. Increased costs of higher standards are estimated to be readily absorbed by energy savings.[19]

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[13] https://www.abc.net.au/news/2018-09-24/young-sailors-parents-warn-of-carbon-monoxide-dangers/10213000T https://doi.org/10.3399/bjgp12X653480

[14] https://www.energy.vic.gov.au/__data/assets/pdf_file/0026/395162/Victorian-Government-Response-to-Coroners-Court-Open-Flue-Gas-Heaters-October-2018.pdf

[15] https://www.health.nsw.gov.au/environment/factsheets/Pages/unflued-gas-heaters.aspx

[16] http://www.bom.gov.au/state-of-the-climate/

[17] https://www.thelancet.com/journals/lanplh/article/PIIS2542-5196(20)30100-5/fulltext?ref=theprepping-com

[18] https://www.washingtonpost.com/world/2021/06/28/canada-record-heat-lytton/

[19] https://onestepoffthegrid.com.au/even-with-rooftop-solar-boom-consumers-are-paying-dearly-for-what-lies-underneath/

Another factor recognized as detracting from built-form energy efficiency is the inconsistency of privately contracted inspectors to rigorously uphold the required standards.[20]

Resurrection of the home insulation program of 2009 would appear to be a challenge following the finding of supervisory failures but it is certainly worthy of consideration. Other potential improvements in residential construction and materials are beyond the remit of DEA.

Although not strictly related to housing energy efficiency, there would appear to be substantial wastage of gas (methane or propane) when used for heating outdoor dining areas on pavements in the colder months especially when there is available seating indoors. Outdoor heating can hardly be classified as an essential need for gas.

2. Electrification instead of reliance on gas

Nearly all household appliances and equipment powered by gas can now be powered by electricity which can be derived from household solar panels with or without battery storage, and from the ever increasing proportion of grid renewable energy. Heat pump technology now offers an alternative to gas for domestic hot water and central heating and cooling. Heat-pump technology is more efficient for heating than using electricity through circuitry resistance.[21]

The outlined plans to boost gas supply and distribution networks in Victoria (Consultation Paper page 43) would seem contradictory to the aims of the Gas Reduction Roadmap and the goal to reach net-zero emissions by 2050. Recommencement of conventional gas exploration not only sends the wrong message to the community, but it also entrenches current practices that will make it even more difficult to establish an adequate renewable energy industry. Since the gas sector contributes 15.8% of Victoria's total emissions (Consultation Paper page 10) and AEMO has forecast relatively constant gas consumption over the next two decades,[22] usage will have to change dramatically to meet Victoria's ERTs. The Victorian government should see its role as being crucial to the channelling of community preference from gas to electricity as soon as possible.

One major attraction for rapid transition is that gas is now a costly energy source in Australia. Recent modelling suggests that for many Australian homes, it would be cheaper over 10 years to switch from gas to efficient electric appliances, replacing gas appliances as they fail or in some cases even before this.[23] Greater savings can be found when disconnecting completely from the gas network as this eliminates the gas supply charge of several hundred dollars a year. When households withdraw from gas, supply companies must be prohibited from charging excessive disconnection fees.

Overseas, gas supply has been banned in new buildings in some cities.[24,25] In Australia, many homes and some new housing developments are already switching to all-electric and are not connecting to a reticulated gas supply[26] although in some jurisdictions household gas connection has been mandatory.[27]

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[20] https://www.choice.com.au/home-improvement/energy-saving/reducing-your-carbon-footprint/articles/house-energy-efficiency-ratings

[21] https://ieefa.org/wp-content/uploads/2020/06/Gas-Cannot-Stimulate-the-Economy-Reduce-Emissions-or-Provide-Cheap-Power_June-2020.pdf

[22] http://forecasting.aemo.com.au/Gas/AnnualConsumption/Total

[23] https://renew.org.au/wp-content/uploads/2018/08/Household_fuel_choice_in_the_NEM_Revised_June_2018.pdf

[24] https://www.cbsnews.com/news/cities-are-banning-natural-gas-in-new-homes-because-of-climate-change/

[25] https://www.abc.net.au/news/2020-11-19/san-francisco-just-banned-gas-in-all-new-buildings.-could-it-ev/12896666

[26] https://reneweconomy.com.au/canberra-households-reject-gas-as-act-moves-to-end-mandatory-connections-47346/

[27] https://reneweconomy.com.au/new-estates-are-being-forced-to-install-gas-pipelines-this-is-wrong-10697/?utm_source=RE+Daily+Newsletter&utm_campaign=ccc665fa80-EMAIL_CAMPAIGN_2019_01_30_03_59&utm_medium=email&utm_term=0_46a1943223-ccc665fa80-40427897

DEA has been advocating for reduction of greenhouse gas emissions from the healthcare sector, and in conjunction with the Australian Medical Association, has called for a sector wide emissions reduction of 80% by 2030 and net zero by 2040.[28] Since gas provides 48% of direct energy consumption in Victorian public hospitals,[29] a key recommendation is that there be no new gas instillations or upgrades in Australian hospitals from 2021.[30] This recommendation will assist Victoria in meeting adequate emissions reduction targets in conjunction with the Victorian government's intent that all public hospitals will be supplied by 100% renewable energy by 2025.[31] If plans proceed for a new public hospital in Melton,[32] it will need to follow the examples already set in South Australia and the ACT in excluding gas installation from new hospitals.[33,34]

Several schools in Victoria are also moving from gas to electricity, both for environmental and economic reasons.[35]

If every effort is made to reduce reliance on gas, the anticipated shortfalls in supply towards the end of this decade could be averted and would be a major step in allowing Victoria to meet its interim ERTs. Projections for gas use beyond the decade are unclear. Most analysts forecast flat or reduced demand[36] belying policies which are contingent on vastly increased demand.[37]

3 & 4. Substitution with hydrogen, biogas

Continuing role for methane gas

Methane will likely be required for specialized heavy industry and as feed stock for many industrial processes. Gas may be required for small peaking plants as coal-fired power is withdrawn, but since only 8.5% of gas production is used for electricity generation in Victoria, the demand would not be high[38] and it would be uneconomic to embark on further gas exploration and extraction to support a small and reducing need.[39]

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[28] https://insightplus.mja.com.au/2021/19/hospital-environmental-sustainability-end-of-the-beginning/

[29] https://www.mja.com.au/journal/2021/renewable-energy-use-australian-public-hospitals

[30] https://www.dea.org.au/wp-content/uploads/2020/12/DEA-Net-Zero-report_v11.pdf

[31] https://www.climatechange.vic.gov.au/__data/assets/pdf_file/0021/521364/210502-Climate-Plan-To-Cut-Emissions-And-Create-Jobs.pdf

[32] https://www.theage.com.au/politics/victoria/after-decades-of-campaigning-melton-to-get-new-public-hospital-20210704-p586ow.html?btis

[33] https://www.wch.sa.gov.au/about/new-wch-project

[34] https://www.cmtedd.act.gov.au/open_government/inform/act_government_media_releases/rattenbury/2020/act-government-announces-first-all-electric-public-hospital-in-australia-if-not-the-world

[35] https://www.theage.com.au/national/victoria/victorian-state-schools-start-switching-off-natural-gas-20210701-p585wc.html

[36] http://forecasting.aemo.com.au/Gas/AnnualConsumption/Total

[37] https://www.theguardian.com/commentisfree/2020/feb/01/scott-morrison-is-stuck-in-a-time-warp-more-gas-is-not-the-answer?utm_term=RWRpdG9yaWFsX0d1YXJkaWFuVG9kYXlBVVMtMjAwMjAz&utm_source=esp&utm_medium=Email&CMP=GTAU_email&utm_campaign=GuardianTodayAUS

[38] https://www.aemo.com.au/-/media/Files/Electricity/NEM/Planning_and_Forecasting/Inputs-Assumptions-Methodologies/2019/2019-20-Forecasting-and-Planning-Scenarios-Inputs-and-Assumptions-Report.pdf

[39] https://ieefa.org/wp-content/uploads/2020/06/Gas-Cannot-Stimulate-the-Economy-Reduce-Emissions-or-Provide-Cheap-Power_June-2020.pdf

Developments in the recycling of plastics are on the verge of replacing the usual gaseous source of ethane which is a by-product of gas and oil extraction.[40] How much of the commercial interest in gas mining is the disguised need for ethane is unknown.[41]

The Australian Energy Market Operator (AEMO) has developed scenarios in their Integrated System Plan (ISP) for future energy use ranging from "slow change" to "step change", reflecting the degree of direct climate action. The Victorian government is urged to follow this latter scenario with elements of the distributed energy resources (DER) scenario. These pathways might allow Victoria to meet its fair share of climate action, to meet its ERTs and to compensate for federal inaction.[42]

Hydrogen

The Consultation Paper presents the usefulness of hydrogen as a substitution fuel and some of the difficulties that may arise such as hydrogen embrittlement of metal pipes in the reticulation network. However, hydrogen, as an extremely versatile energy mediator, should be pursued vigorously because of its zero carbon emissions on combustion.[43]

DEA is critical of the plans to use brown coal from the Latrobe Valley as a resource for hydrogen production, so-called "brown hydrogen". Although there are plans to investigate the potential role of carbon capture and storage (CCS), this process has generally failed throughout the world and has been an expensive monumental failure in north-west Australia.[44] While presumably the rationale for this project in the Latrobe Valley is to align employment opportunities with access to coal, would it not be just as reasonable to establish a green hydrogen industry where pure water from the Wonthaggi desalination plant is available and to where workers could be translocated at a relatively short distance?

The generation of green hydrogen is reported to be cost competitive[45] and opens enormous possibilities for energy storage and use which are well described elsewhere.[46]

Biogas

The production of biogas involves issues which may result in more environmental damage that can be permitted under a low emissions pathway.[47,48] Biogas needs to be refined to biomethane for injection into the existing gas networks as it contains contaminants including CO_2 and other gases. When relying on biogas from crops, multiple factors need to be considered to ensure that all environmental matters related to land management are considered.[49]

5. Emerging technologies

Of the multiple emerging technologies, it is essential that preference be given to those which are carbon neutral over their long-term operation. Since 83% of Victoria's households are connected to mains gas and since two-thirds of Victoria's households use gas for water and space heating (Consultation Paper

[40] https://cen.acs.org/environment/recycling/Plastic-problem-chemical-recycling-solution/97/i39

[41] https://reneweconomy.com.au/does-victoria-really-need-to-find-more-fossil-gas-to-use-as-plastics-feedstock-35599/

[42] https://www.aemo.com.au/-/media/Files/Electricity/NEM/Planning_and_Forecasting/Inputs-Assumptions-Methodologies/2019/2019-20-Forecasting-and-Planning-Scenarios-Inputs-and-Assumptions-Report.pdf

[43] https://www.abc.net.au/radionational/programs/boyerlectures/oil-vs-water-confessions-of-a-carbon-emitter-v1/13072410

[44] https://www.abc.net.au/news/science/2020-09-19/angus-taylor-carbon-capture-storage-gorgon-chevron/12676732

[45] https://www.climatecouncil.org.au/wp-content/uploads/2021/05/Kicking-the-Gas-Habit-How-Gas-is-Harming-our-Health.pdf

[46] https://www.amazon.com.au/Superpower-Australias-Opportunity-Ross-Garnaut/dp/1760642096

[47] https://www.sciencedirect.com/science/article/abs/pii/S0959652611004161

[48] https://reneweconomy.com.au/why-burning-trees-for-energy-makes-no-sense

[49] https://www.futurebiogas.com/why-growing-crops-for-green-gas-production-makes-economic-and-environmental-sense/

page 20), it would seem logical to pursue technologies which can assist in moving away from gas for household heating. Such technologies include heat-pumps powered by zero-emissions electricity for space heating and cooling (reverse-cycle). With roof-top solar plus battery storage, costs can be virtually zero. Because the payback period for residential solar technologies can be up to 5 years, would it not be unreasonable for the Victorian government to offer loans with repayments staggered to match the anticipated savings at that time.

One area of neglect is the failure to use factory roof-tops as a major site for roof-top solar. Large warehouses, schools and factories which have mainly daytime operations could satisfy most of their energy requirements on-site and so would not be drawing on the grid, thus easing the pressure on power supplies and any future need for peaking gas. Mandating such a requirement for industry would be reasonable since it would be cost-neutral in a relatively short time.[50]

There are multiple technologies available for enhancing security and reliability of renewable electricity supply. It is not possible for DEA to comment on affordability as costs are met and profits received at many different levels of community, business and government. Emerging technologies include microgrids,[51] enhanced major grid networks, interstate connections, home and grid scale batteries, synchronous condensers,[52] new inverter technology, pumped hydro and storage, off-shore wind farms, and demand management.[53]

A second electrical cable link to Tasmania and another between SA, Vic and NSW will enhance interstate transfer and correct for regional differences in supply of wind and solar.[54]

Australia is also regarded as having one of the best wind resources in the world.[55] Coastlines are particularly windy areas and since 80% of the population lives within the coastal zone,[56] there is huge potential for wind-farms to expand into local sea-space.[57] Early barriers to construction of off-shore wind turbines have largely been overcome.[58]

Last year a private company announced plans to couple regional community based renewable energy projects in north-central Victoria with hydrogen storage and lithium-ion batteries, committing to a total of 30 MW[59] which will be spared the difficulties of grid connection.

In USA, solar researchers have reported developing solar panels capable of 47% efficiency under concentrated illumination[60] while in Australia, a record efficiency of 28% has been achieved for unconcentrated illumination.[61]

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[50] https://www.choice.com.au/home-improvement/energy-saving/solar/articles/solar-panel-payback-times

[51] https://onestepoffthegrid.com.au/microgrid-feasibility-funding-awarded-to-17-projects-in-round-one-of-federal-scheme/

[52] https://reneweconomy.com.au/big-spinning-machines-arrive-in-south-australia-to-hasten-demise-of-gas-generation-64767/

[53] https://www.sciencedirect.com/science/article/pii/S0360544217309568 https://ieefa.org/wp-content/uploads/2020/06/IEEFA_Why-Aluminium-Smelters-are-a-Critical-Component-in-Australian-Decarbonisation_June-2020.pdf

[54] https://arena.gov.au/blog/marinus-feasible/

[55] https://www.tai.org.au/content/wind-energy-climate-and-health-evidence-impacts-wind-generated-energy-australia

[56] http://www.ga.gov.au/ausgeonews/ausgeonews201103/climate.jsp#:~:text=More%20than%2080%20per%20cent%20of%20Australians%20live%2%20the%20coastal%20zone.

[57] http://www.ga.gov.au/scientific-topics/energy/resources/other-renewable-energy-resources/wind-energy

[58] http://www.staroftheSouth.com.au/

[59] https://providences.com.au/solar-farm-project-powers-victorias-renewable- energy-industry/

[60] https://www.sciencedaily.com/releases/2020/04/200414173255.htm#:~:text=Scientists%20at%20the%20National%20Renewable,was%20measured%20under%20concentrated%20illumination

[61] https://www.engineersaustralia.org.au/News/new-world-record-solar-cell-efficiency

6. Fugitive Emissions

Methane escapes at all stages of gas production from mining to end use. Although venting and flaring can be monitored, the extent of true fugitive emissions is not readily known but is likely to be higher than generally reported.[62] Fugitive emissions need be only 2% of total gas production to render gas no better than coal in contributing to climate change because of the higher forcing value of methane as a greenhouse gas (86 times that of CO_2 over a 20-year period).

Once mines have been created, escape of methane can continue for years. Globally, methane contributions from fossil fuel usage are roughly equal to that from wetlands, agriculture and waste,[63] and are setting the course for an estimated global warming of 4.3°C by year 2100. While attending to methane emissions from all sources, the sector where emissions can be reduced most definitively is by keeping gas mining to a minimum. All jurisdictions must play their part in reducing fugitive methane emissions to avoid potential climate catastrophe.

[62] https://www.nature.com/articles/s41586-020-1991-8

[63] https://iopscience.iop.org/article/10.1088/1748-9326/ab9ed2