Subject: Oil Age comming to an end...
From: Corrie Kost <kost@triumf.ca>
Date: Thu, 03 Apr 2008 12:22:16 -0700
To: Mayor and Council - DNV <Council@dnv.org>
CC: 'FONVCA' <fonvca@fonvca.org>

Your Worship & Members of Council,

In line with the District policy of going green and sustainability, I have attached a copy of the report by Gary Kendall, titled "Plugged in: The End of the Oil Age" (available from http://assets.panda.org/downloads/plugged_in_full_report___final.pdf). At the very least I encourage you to read the Preface. Consideration of local measures the council of DNV can institute to encourage a move to such electric vehicles (even symbolically) would be welcomed.
Yours truly,

Corrie Kost

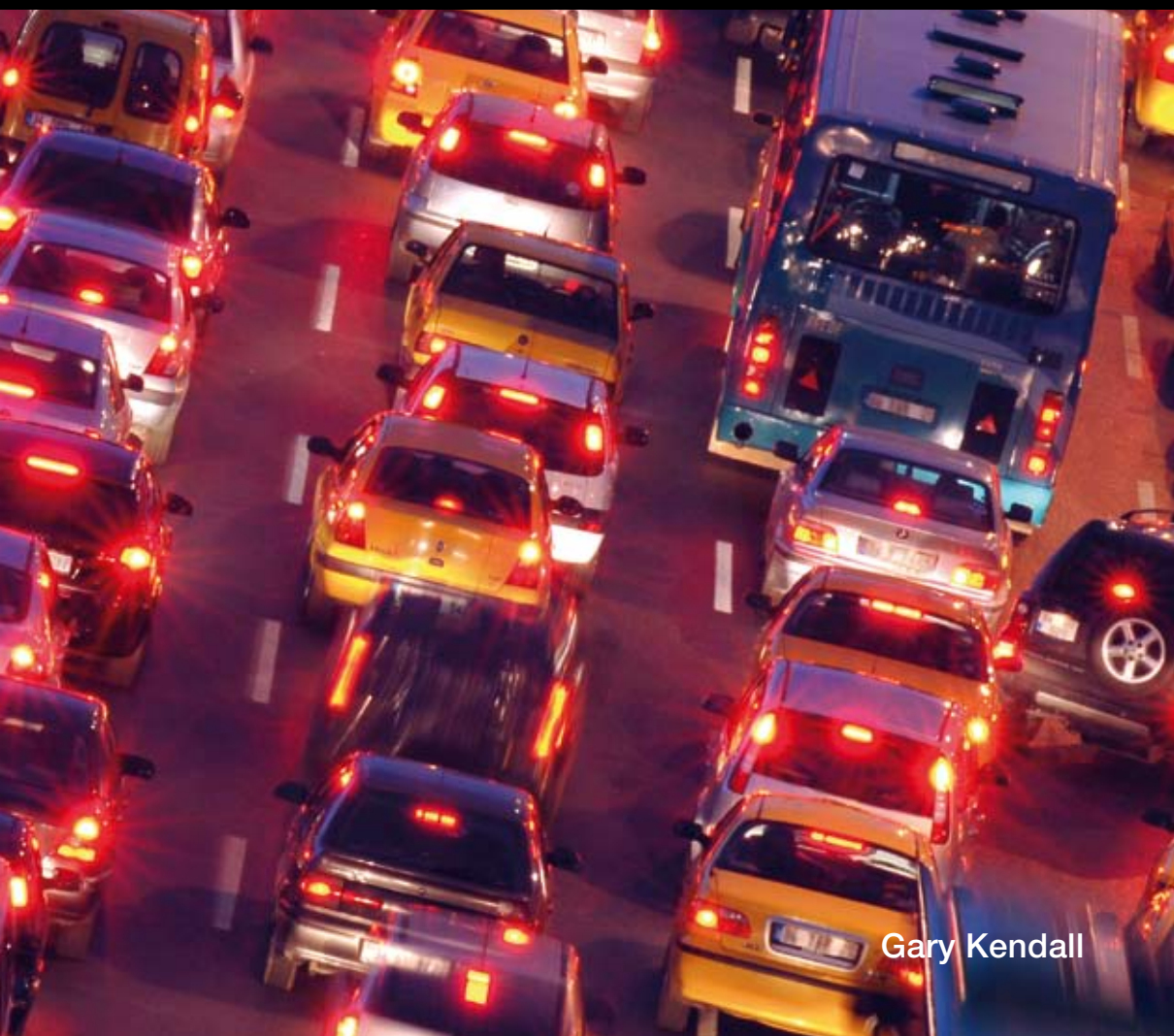
plugged_in_full_report___final.pdf	**Content-Type:** application/nappdf **Content-Encoding:** base64

WWF

for a living planet®

PLUGGED IN

THE END OF THE OIL AGE



Gary Kendall

WWF (World Wide Fund for Nature) is one of the largest and most respected independent conservation organisations in the world. With offices in over 90 countries and almost 5 million supporters across all continents, WWF proposes solutions to stop the degradation of planet's natural environment and to build a future in which humans live in harmony with nature. Combatting climate change and reducing threats to biodiversity on land and sea are among the key priorities for WWF's work.

PLUGGED IN

THE END OF THE OIL AGE

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LIST OF ABBREVIATIONS AND ACRONYMS

AT PZEV	Alternative Technology Partial Zero Emissions Vehicle
BAU	Business As Usual
bbl	Barrel (unit of measure: volume)
BEV	Battery Electric Vehicle
boe	Barrel of oil equivalent (unit of measure: energy)
BTL	Biomass-to-Liquids
CCS	Carbon Capture and Storage
CHP	Combined Heat and Power
CNOOC	China National Offshore Oil Company
CNPC	China National Petroleum Corporation
CTL	Coal-to-Liquids
EV	Electric Vehicle
FCEV	Fuel Cell Electric Vehicle
GDP	Gross Domestic Product
GHG	Greenhouse Gas
GTL	Gas-to-Liquids
HEV	Hybrid Electric Vehicle
IEA	International Energy Agency
ICE	Internal Combustion Engine
ICEV	Internal Combustion Engine Vehicle
ICT	Information and Communications Technology
IOC	International Oil Company
IPCC	Intergovernmental Panel on Climate Change
kWh	Kilowatt-hour (unit of measure: energy)
NDRC	National Development and Reform Commission
NOC	National Oil Company
OECD	Organisation for Economic Cooperation and Development
ONGC	Oil and Natural Gas Corporation
OPEC	Organisation of Petroleum Exporting Countries
PHEV	Plug-in Hybrid Electric Vehicle
toe	Tonne of oil equivalent (unit of measure: energy)
T&D	Transmission and Distribution
UNFCCC	United Nations Framework Convention on Climate Change
WWF	World Wide Fund for Nature (formerly World Wildlife Fund)
ZEV	Zero-emissions Vehicle

PREFACE

Liquid hydrocarbon fuels derived from crude oil provide ninety-five percent of the primary energy consumed in the transport sector worldwide. There is no other sector which is so utterly reliant on a single source of primary energy, and this fuel specificity represents a unique threat to both the environment and global security.

The transport sector as a whole, which includes automotive, aviation, and marine transportation modes, is responsible for roughly one-quarter of energy-related greenhouse gas emissions worldwide, the second largest sectoral contribution after power generation. Despite growing awareness of the dangers and causes of global warming, the climate change impacts of transport have, until now, played an extremely minor role in the development of alternative fuels. Economic and political considerations are frequently addressed at the expense of the environment, and the transport sector is no exception. Many of the fuel technologies which are either under consideration or in various stages of commercialisation have environmental footprints which are significantly worse than conventional crude oil. They are developed primarily in response to energy security concerns, stoked by fears of resource nationalism as remaining crude oil reserves concentrate into the hands of the few.

In order to avert the worst impacts of climate change, the global economy must as soon as possible embark on a pathway towards decarbonisation and sustainability. Within the power sector – the number one source of greenhouse gas emissions today – a broad range of sustainable low-carbon generating options exist, many of which are becoming increasingly competitive as climate change policies penalise carbon dioxide emissions worldwide. Meanwhile, the transport sector looks set to increase its carbon footprint as the oil industry and governments are forced to exploit these energy-intensive unconventional oils to satisfy a steadily growing demand for liquid fuels. Road vehicles account for three-quarters of all the primary energy consumed in transport, thus we focus the following discussion on the automotive sub-sector.

This book will argue that the very term 'alternative fuels', as it is applied today, may be misleading the public and policy makers, since the fuels themselves are essentially identical to what we currently derive from conventional crude oil. These physical and chemical likenesses represent the greatest advantage of today's oil substitutes – minimal disruption to the status quo – but also describe their fundamental limitation: they sustain our dependency on the internal combustion engine powering a mechanical drivetrain, an outdated combination which is inherently inefficient in converting stored chemical energy into motive energy.

Energy efficiency is by far the cheapest and most immediate means to reduce primary energy consumption and greenhouse gas emissions, and will therefore be an important goal in all sectors and applications. In addition to energy efficiency, there is an urgent need to accelerate the development and commercialisation of low-emissions technologies. However, while the automotive transport sector remains firmly shackled to the internal combustion engine, the best we can hope for are incremental vehicle efficiency gains which will be wiped out by the charge towards high-carbon unconventional oils.

Incremental efficiency improvements will no longer suffice. The climate change imperative – to avert catastrophe, global greenhouse gas emissions must peak and decline within the next decade – demands transformational change, which only comes about through disruption to the status quo. For the main incumbent stakeholders in the world's transport infrastructure – from oil producing nations and corporations to automotive manufacturers – perpetuating our dependence on liquid hydrocarbon fuels is the surest pathway to continued growth and profitability in the short-term. It might be argued that in the context of climate change, their focus on short-term goals is at best myopic and at worst negligent. But this view fails to appreciate that companies are encouraged to behave this way by the rules we as a society have placed upon them. In this light, we cannot depend entirely upon today's dominant transport solution providers to drive – or even support – a shift away from the liquid hydrocarbon paradigm any time soon.

Fortunately, there is a way out of the oil trap. Vehicles which are capable of receiving electricity from the grid will directly benefit from future emissions reductions and diversification of primary energy sources in the power sector. Thus, over time, grid-connected solutions such as battery-electric vehicles and plug-in hybrid electric vehicles – supplemented by sustainable biofuels for longer journeys – will grow successively cleaner while the energy system as a whole becomes more secure. Moreover, the electric powertrain is inherently energy efficient, up to four times more efficient than its mechanical counterpart. And, surprising as it may sound, we need not await the coming renewable energy revolution before expediting electric vehicles. Even based on today's relatively carbon-intensive energy mix, the electrification of automotive transport can deliver an immediate reduction of greenhouse gases, an improvement in urban air quality and noise levels, and significantly lower operating costs.

Coupled with concerted efforts to drive modal shift, optimise urban planning practices, and encourage behavioural change, the widespread adoption of electric powertrain technology will transform automotive mobility by helping to reduce the world's dependency on liquid hydrocarbon transportation fuels. It will create an explicit link between the traditionally separate power generation and transport sectors, thereby dramatically broadening the range of sustainable renewable energy options which can propel the world's motor vehicles. Establishing and accelerating this sectoral convergence will directly address many of the world's environmental challenges far beyond climate change mitigation, not least by relieving the mounting pressure on fragile ecosystems from relentless exploration, production, distribution, processing, and combustion of the Earth's limited hydrocarbon resources. Furthermore, the electrification of automotive transport will enhance global security by substantially reducing the sector's ninety-five percent dependency on crude oil, which has such a highly destabilising impact on the world today.

It should be self-evident that the scale of the task is enormous, but the resulting benefits will be even greater, and that is surely the very definition of transformational change. Oil companies must hasten

the decarbonisation of their energy portfolios, assisted by the financial sector eliminating the incentives which reinforce existing unsustainable business models. Policy makers have an important role to play in order to remove the market barriers to electric vehicles which are cemented by our lock-in to the liquid hydrocarbon paradigm. Utilities, technology companies, and renewable energy suppliers stand to profit from accelerating the electrification of automotive transport, and should therefore be eager to establish new business models and public/private sector partnerships.

Geographically, a few key markets will be keen to adopt grid-connected vehicles: North America, the EU, Japan, and the rapidly emerging economies of China and India. The US is the world's largest automotive market, number one consumer of crude oil, and currently seeks to reduce import dependence by exploiting energy-intensive unconventional hydrocarbons. Europe is also a huge automotive market, while the EU positions itself as a leader on environmental protection – climate change in particular – and therefore represents an important focal point in terms of legislation and the setting of vehicle operating standards. Like the US, the EU also seeks ways to urgently address crude oil import dependency.

Japan imports one hundred percent of its crude oil supplies, and currently leads the world in hybrid vehicle technology, seen by many as an important step towards grid connectivity. Meanwhile, China, the "world's factory" has a relatively small automotive fleet and consequently does not suffer the same degree of lock-in as OECD nations. However, with sales of private cars growing at around twenty-two percent year on year, China recently became the second largest automotive market in the world. Its vehicle population could eclipse the US within two decades, an outlook which drives the country towards unconventional hydrocarbon resources such as coal-to-liquids. India faces many of the same challenges as its Asian neighbour, yet currently boasts the world's best selling battery-electric vehicle. Thus, initiating a paradigm shift in the Chinese and Indian markets will have a major impact both domestically and in terms of vehicle exports.

An environmentally sustainable transport sector will not be achieved through electrification alone. Additional measures to reduce overall demand through smarter urban planning, encouraging modal shift to mass transit, from road to rail, increased use of telecommunications technologies, and car sharing will make necessary and significant contributions. However, with around eight hundred million motor vehicles in the world today and that number growing inexorably, road-based transport will continue to play a vital role in the delivery of essential mobility services which underpin economic and social development. This book aims to demonstrate how automotive electrification can ease the necessary transition towards *a transport paradigm which is both highly efficient and compatible with a sustainable renewable energy future.*

"No power on Earth can stop an idea whose time has come"

Victor Hugo