Network Design for Road Safety
Pre and Post Disruption

20 November 2019

Austroads

What is Austroads?

The peak organisation of Australasian road transport and traffic agencies.

Austroads members comprise 11 road jurisdictions from Australia and New Zealand

Representing National, State/Territory and Local government interests

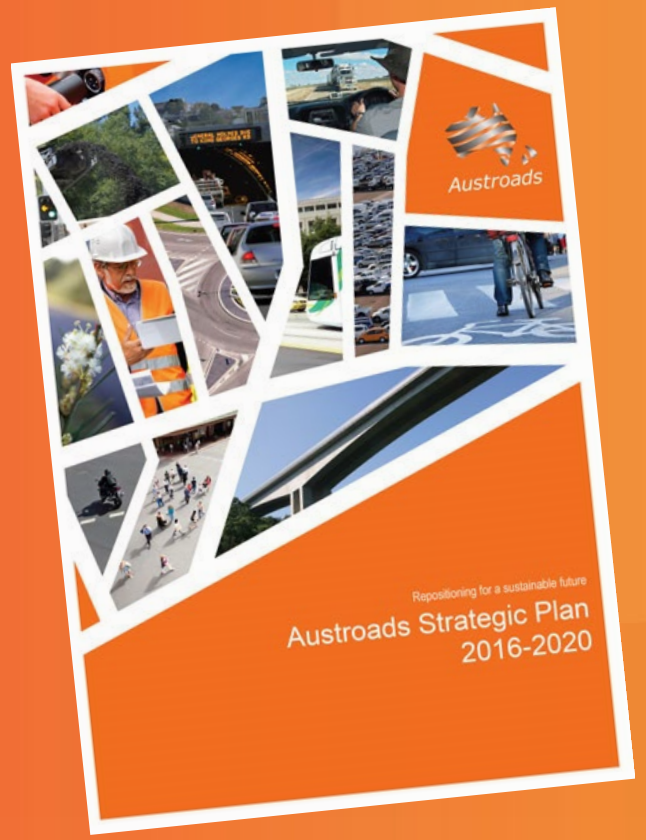
And are collectively responsible for the management of over 900,000km of roads

Valued at about $250b and being the single largest community asset

in Australia and New Zealand (with annual expenditure of >$25b)

$165b (80% LG)

Austroads Strategic Plan 2016-2020



Shared Knowledge

Collaborative Delivery

Embedded Value

Harmonised Practice

for 4 Programs

Safety Program Objectives, Program, Projects from 2016 - 2019

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Balanced Scorecard

Safety Program Objectives from 2016

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Customer

"Crisp" Guidance for LG

Integrated Safety Practice (RSM)

Comprehensive Safety Library

People

Link with Key Stakeholders

Ideas Rapidly to Guidance

Share Safety Legal Risk Findings

Products

Promote Safety as # 1 Priority

Safety-specific Program Plan

2-page Safety Info Sheets

Practice

Integrate Safety Programs

Evidence for Emerging Practice

Safety Metrics for Austroads Progr

In your satchel

5 Pillars - Summary

Speed Management
Limits for Context
Community Engagement
Enforcement Principles

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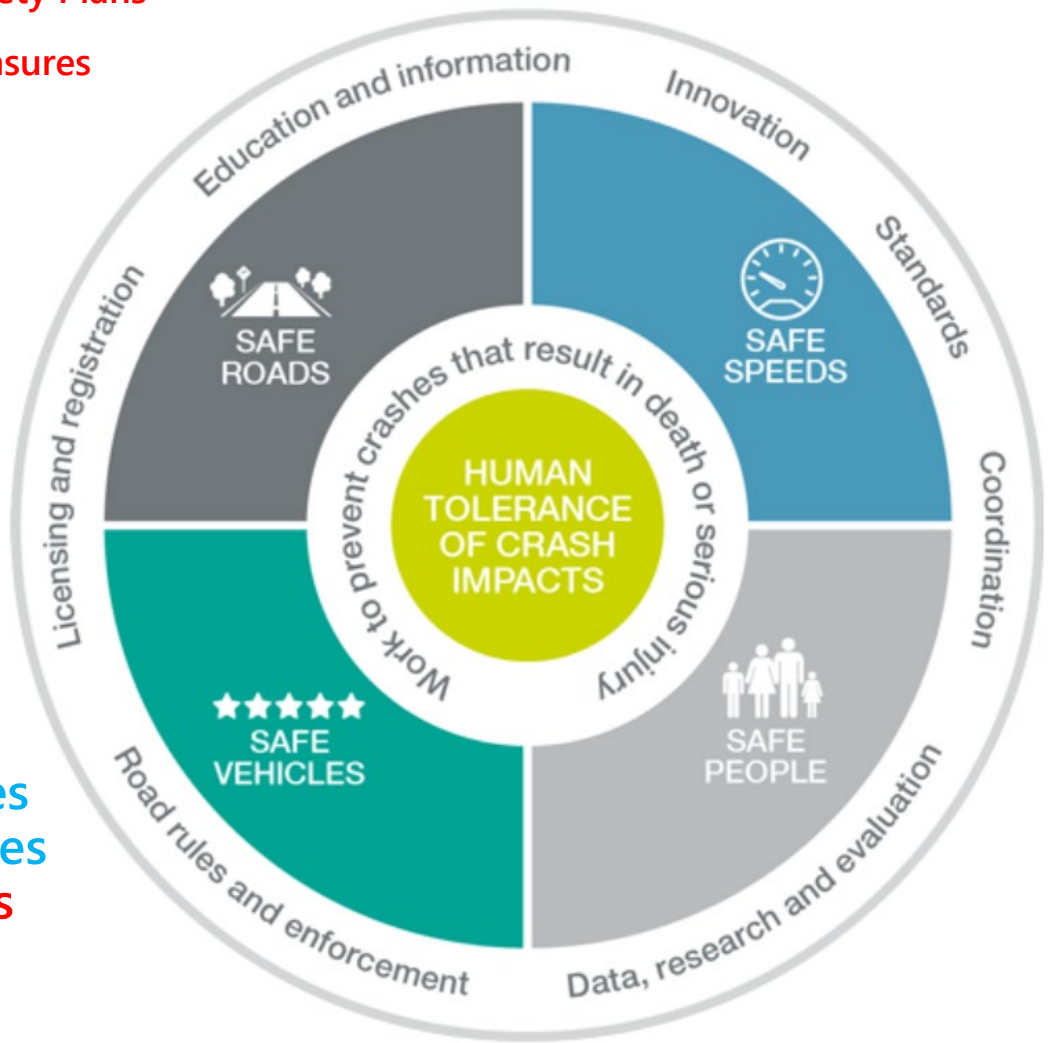
Network-wide Design for Safety Plans
Program Development
Motorcycle Perc. Countermeasures
Intersect Performance
Audit Practice
Low Cost High Influence
M&P - Vulnerable Users
Perf-based design
Regional and Rural
Mixed Use Arterials
Rail Crossings
Black Spots
Ped and Cyclist Paths
ROR Risk Threshold
RS Barrier Transitions
SS Assess Framework
ANRAM



National Strategy Modelling
Key Interventions Modelling
System risk mapping
National SI data
Targets and Treatments
Governance and collaboration
Harmonisation Stocktake
Local Government Guidance
Safety Leaders Pack
Integrating RS in Road System Man

Vehicle Standards
Automated Vehicles
Vehicle Technologies
End of Life Vehicles
MMDs

Vehicles as a Workplace
Graduated Licensing
Distracted Driving
Drug Driving
Drink Driving
Hazard Perception Test
Overseas Driver Licensing
Automated Vehicles and Licensing
Older Road User Trends
HV Driver Competency Framework
DL barriers

National Road Safety Performance

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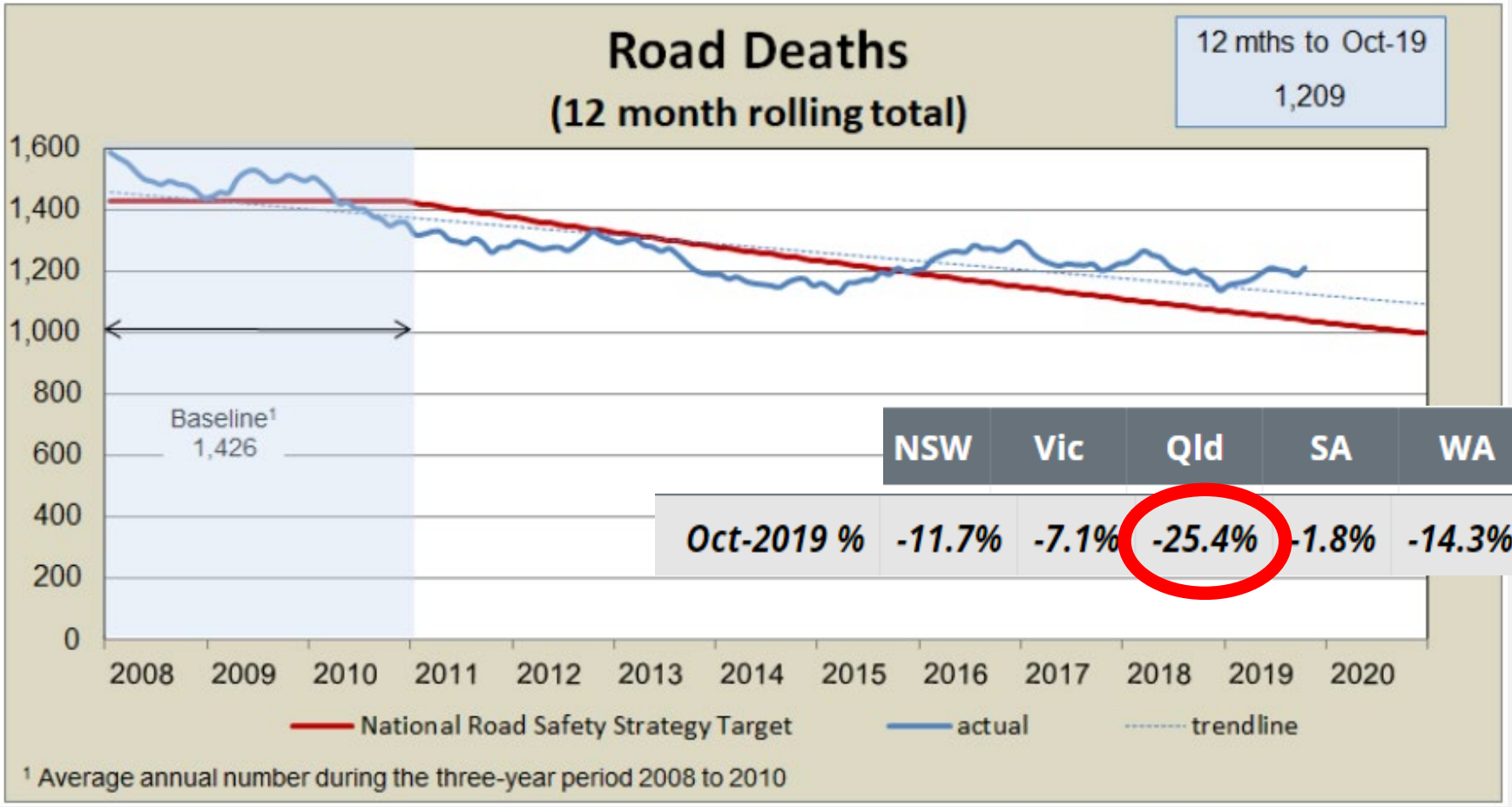
National Performance: 1200 killed and 30,000 injured on Australian Roads



	NSW	Vic	Qld	SA	WA	Tas	NT	ACT	Australia
Oct-2019 %	*-11.7%*	*-7.1%*	*-25.4%*	*-1.8%*	*-14.3%*	*-22.7%*	*-42.3%*	*66.7%*	*-15.3%*

Pre-disruption Context

World-wide Road Safety Plateau

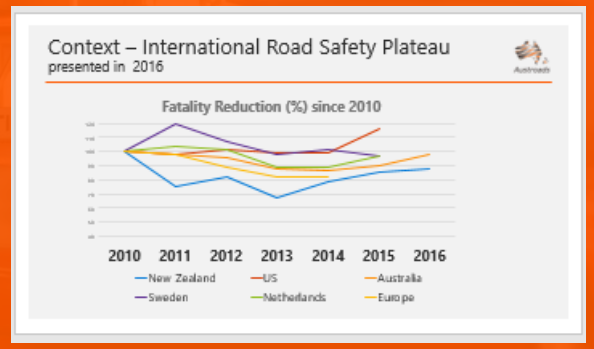
Economic Law of Diminishing Returns

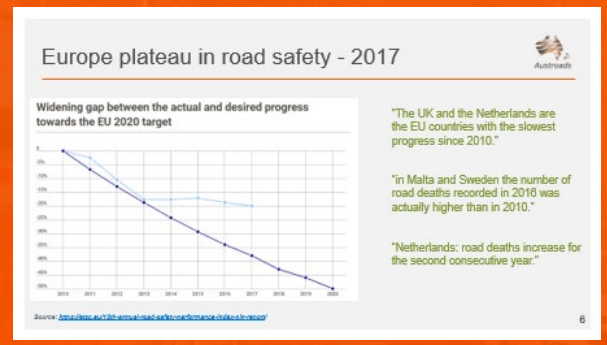
Socio Economic Factors

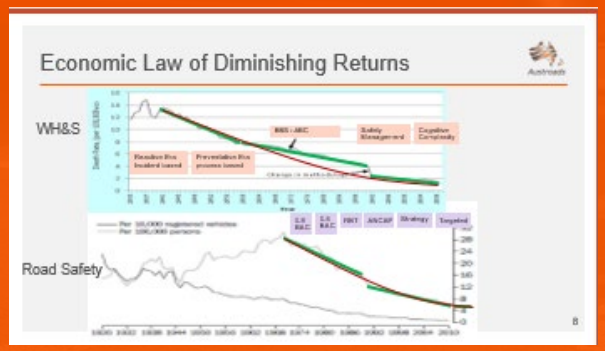
Australia's 500% Spatial Challenge

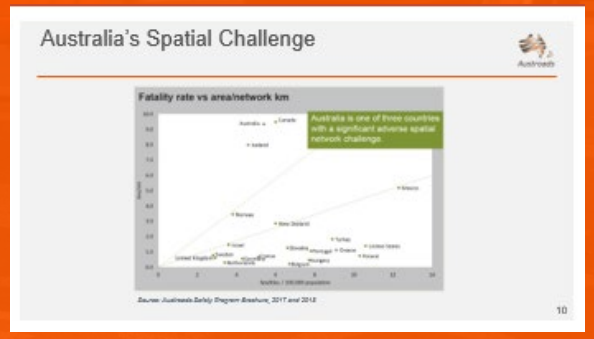
50% crashes on LG roads (80% length)

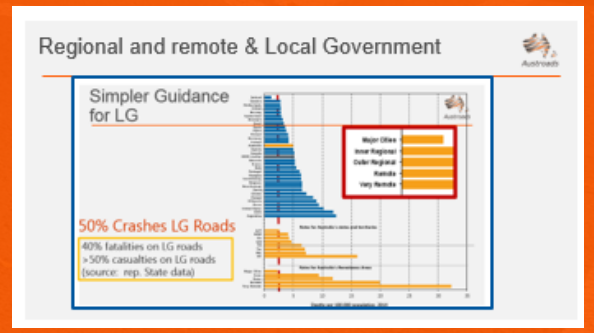
ACT / Urban performing best in world











National Road Safety Strategy 2011-2020
National Road Safety Action Plan 2018-2020

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1. Review speed limits - high risk roads
2. Regional Roads initiatives
3. Urban Intersection treatments
4. Vehicle – technology / AEB
5. Drug testing
6. Speed – vulnerable road users - limits
7. Speed – point to point and cameras *
8. Heavy Vehicle licensing
9. Vehicle – accelerate emerging technology

A. Safety Plans for Corridors

B. Safe System to all Programs
C. Light vehicle standards *
D. National Speed Enforcement
E. Distraction and Mobile Devices *
F. Drink Driving
G. GLS drivers and riders
H. Motorcycle Clothing
I. National Matched Serious Injury Data
J. Remote Road Safety
K. Construction safety
L. Safer cleaner Heavy Vehicle

Safest Network Outcome

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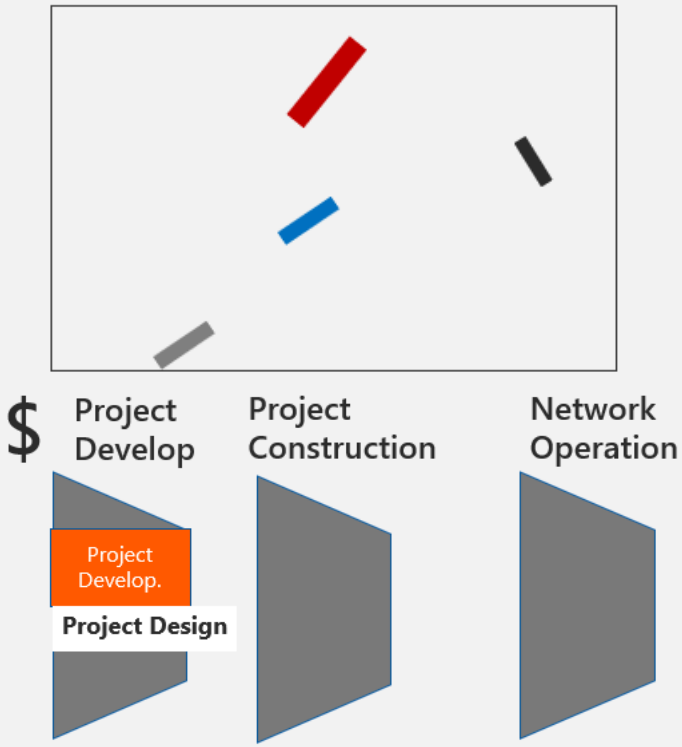

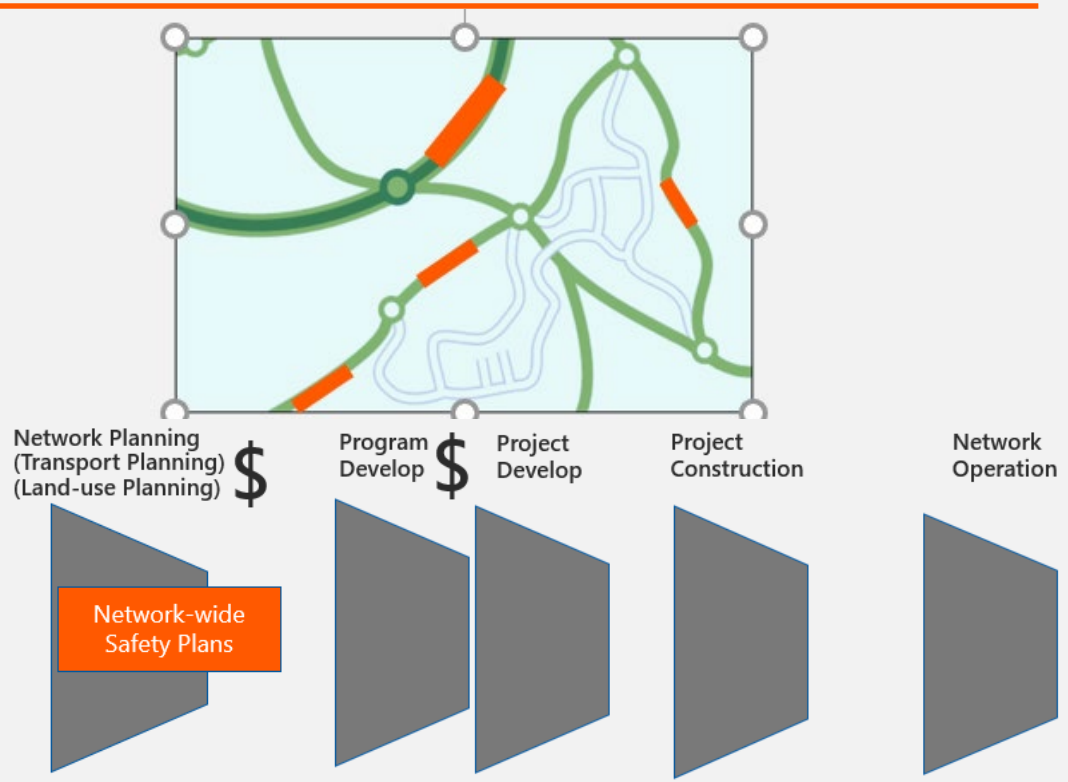

Project Plan

- Best outcome for project budget
- Inconsistent stds/unsustainable
- PM / designer role influence over time

Network-wide Safety Plan

- Best outcome for the network
- Standards set once for function
- Consistent & sustainable

Road Stereotype 4.6
Rural Highway Single Carriage Way
Two Lane Two Way AADT 1000 - 4000

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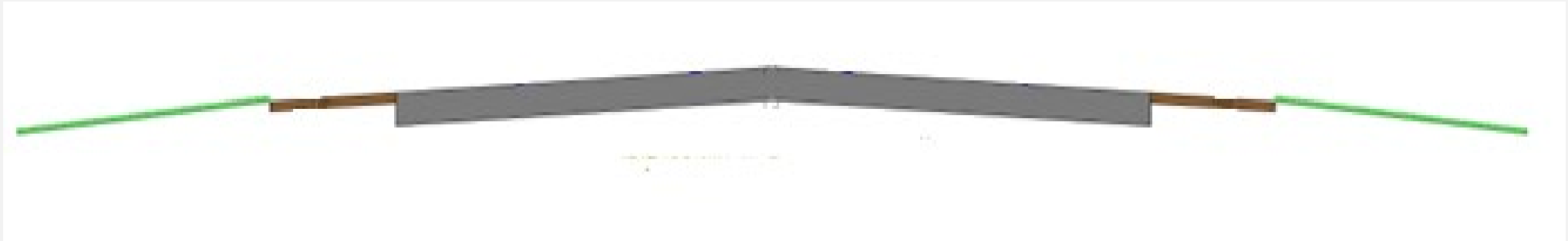
1m 3.3m 3.3m 1m



Factor: Predicted FSI = 3.32

Road Stereotype 4.1
Rural Highway Single Carriage Way
Two Lane Two Way AADT 1000 - 4000

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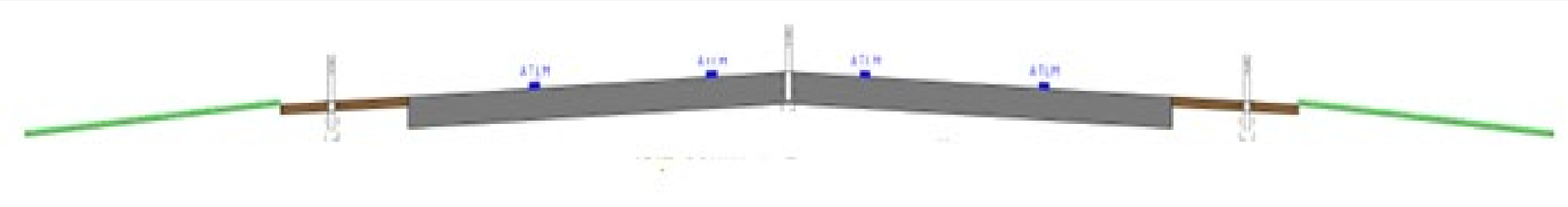
2m Barrier | 3.5m | 2m Barrier | 3.5m | 2m Barrier



Factor: Predicted FSI = 0.02

Corridor Outcome

Saved ** FSI

**Cost $ **

Safest Network Outcome

2-4 weeks effort

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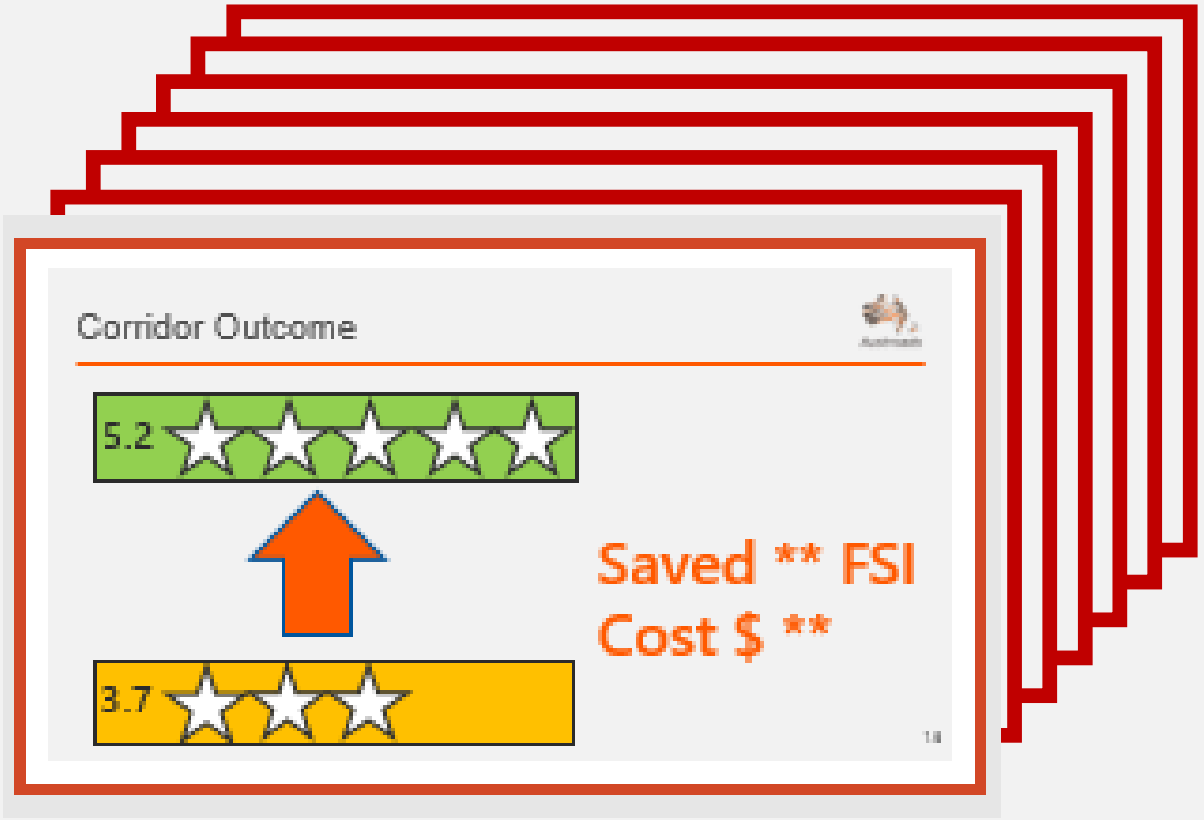
SUM (Corridor Outcomes)



Pre-disruption Community Questions

- Mayor / Councillor

- LG Engineer

Is my LG providing the safest road network possible ……?

Where, when and what are the treatments providing our safest road network …….?

7 World-wide Disruptions

Why are they important?

What are they?

When will we see them?

When should we plan for them?

Post Disruption Period

References and Acknowledgements

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VOLVO

MOBILEYE

TESLA MOTORS

WAYMO

pfp robotics

Siloed Anecdotes – “It is not a priority”

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“The technology is much more difficult than you think”

“For example, Tesla made statements which we did not see”

“Detailed maps are required”

“Vehicles will be running only on part of the network”

Safe System and Hierarchy of Controls

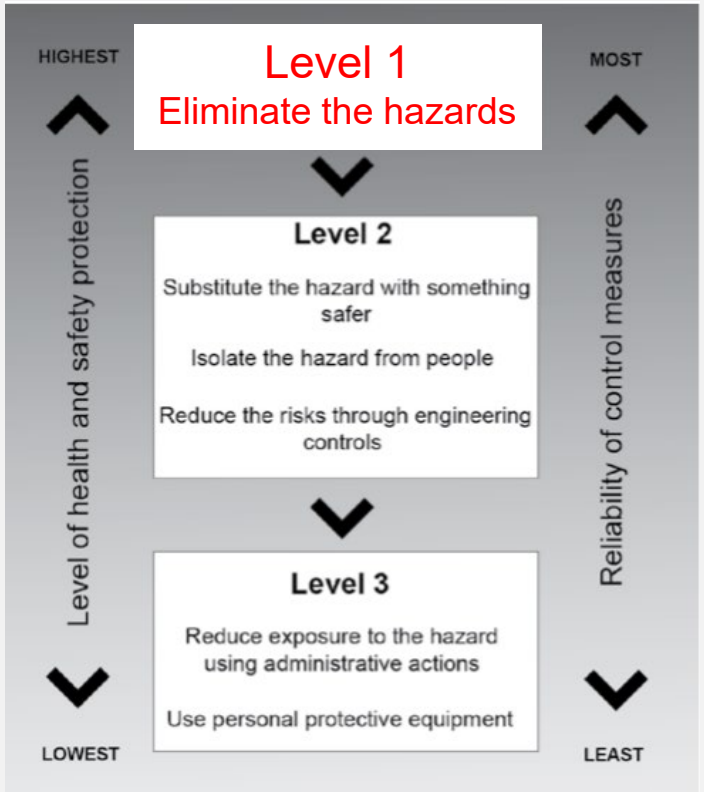
People make mistakes:

"Safe System recognises …..

…..that human error is a feature of the road transport system and….

…… that while much can be done to reduce it, it cannot be eliminated."

+



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No drivers

Source: Guide to Road Safety Part 1, Austroads 2013
https://austroads.com.au/publications/road-safety/agrs01/media/AGRS01-13_Guide_to_Road_Safety_Part_1_Road_Safety_Overview.pdf

Source: Vehicles as a Workplace, Fig C.1, Austroads 2018
https://austroads.com.au/publications/road-safety/ap-r561-18/media/AP-R561-18_Vehicles_as_Workplace.pdf

Tony Seba, 2017 Tech Adoption S-Curves Accelerating

"If you can dream it, you can do it" by Tom Fitzgerald, Disney

(Source: Gizmodo website)

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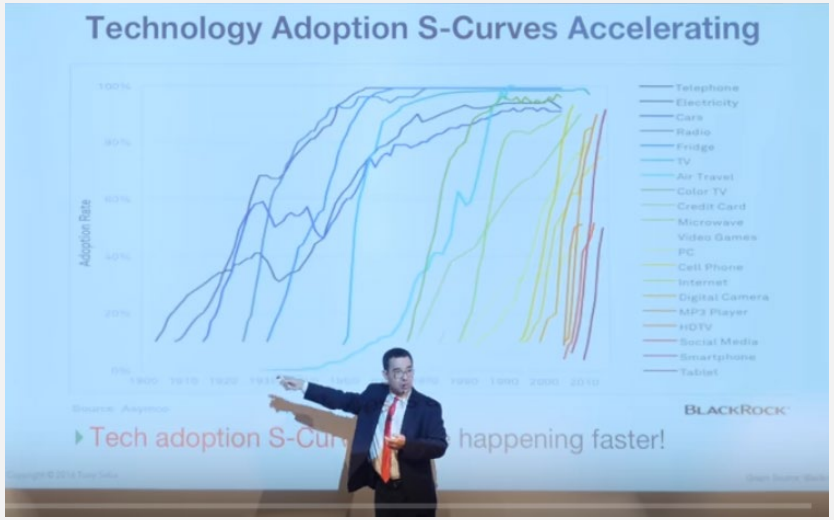

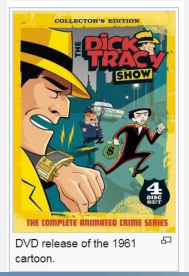

DVD release of the 1961 cartoon.

Source: Wikipedia

Gould (1931)
Dick Tracy
Comic Book 1960

2015
Source: Wikipedia
Apple (2015)

Source: Wikipedia

Hanna Barbera 1962

2018
Source: Create Digital Eng. Aust.
Dutch Manufacturer
PALV-V +50 years

Driverless Car of the Future, advertisement for "America's Electric Light and Power Companies," Saturday Evening Post, 1950s. Credit: The Everett Collection.

2018- ?

Source Wikipedia,

Logan 2019

Produced by Marvel Entertainment, TSG Entertainment and The Donners' Company, and distributed by 20th Century Fox

2018- ?

2019 - California DMV has issued Autonomous Vehicle Testing Permits (with a driver) to the following entities:

(Permit holders are listed by the date the permit was issued – as at 28 Jan 2019)

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Volkswagen Group of America
Mercedes Benz
Waymo LLC
Delphi Automotive
Tesla Motors
Bosch
Nissan
GM Cruise LLC
BMW
Honda
Ford
Zoox, Inc.
Drive.ai, Inc.
Faraday & Future Inc.
Baidu USA LLC
Valeo North America, Inc.

NIO USA, Inc.
Telenav, Inc.
NVIDIA Corporation
AutoX Technologies Inc
Subaru
Udacity, Inc
Navya Inc.
Renovo.auto
PlusAi Inc
Nuro, Inc
CarOne LLC
Apple Inc.
Pony.AI
TuSimple
Jingchi Corp
SAIC Innovation Center, LLC

Almotive Inc
Aurora Innovation
Nullmax
Samsung Electronics
Continental Automotive Syst. Inc
Voyage
CYNGN, Inc
Roadstar.Ai
Changan Automobile
Lyft, Inc.
Phantom AI
Qualcomm Technologies, Inc.
SF Motors Inc.
Toyota Research Institute
Apex.AI
Intel Corp

Ambarella Corporation
Gatik AI. Inc.
DiDi Research America LLC
TORC Robotics Inc
Boxbot Inc
EasyMile
Mando America Corp.
Xmotors.ai, Inc.
Imagry Inc.
Ridecell Inc.
AAA NCNU
ThorDrive Inc
Helm.AI Inc
Argo AI, LLC

2018 – Simulation testing and on-road testing

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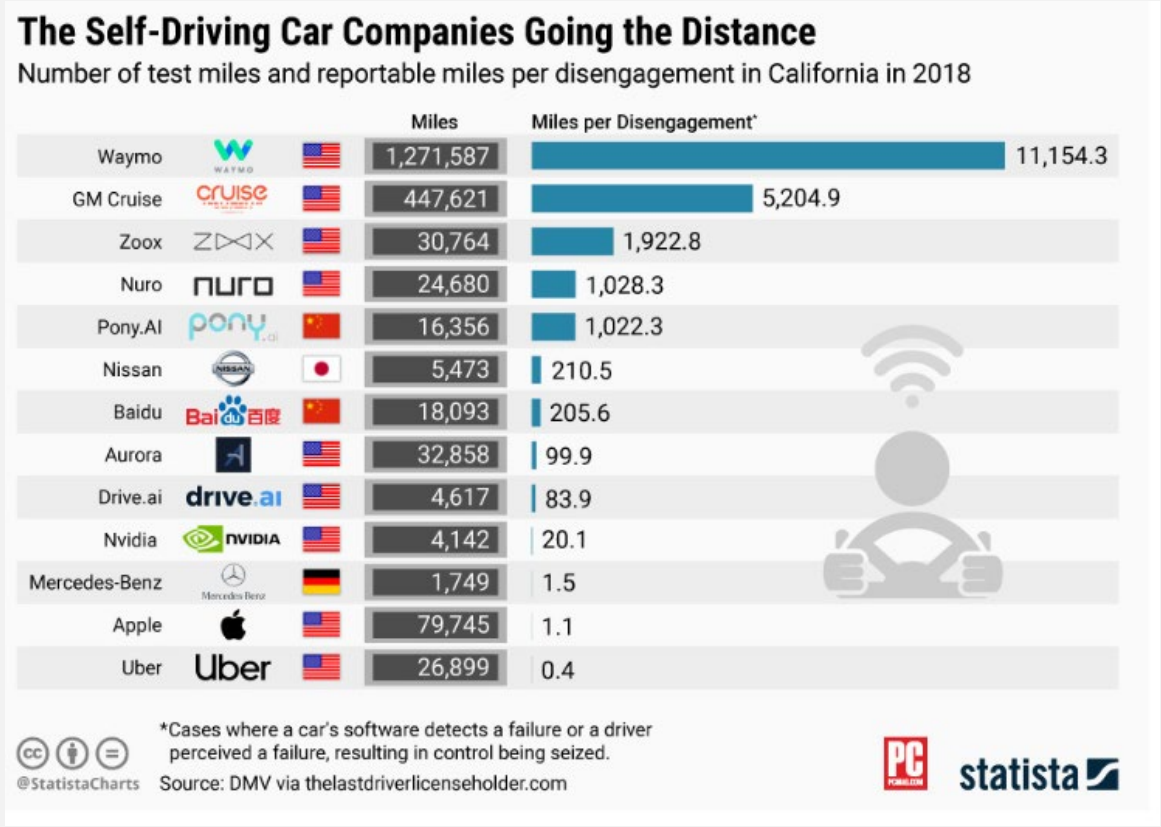
- Oct 2018 Waymo, the self-driving unit of Google parent Alphabet, has been granted permission to operate fully driverless cars without human drivers behind the steering wheel on public roads in California. The company is the first to receive a driverless permit in the state.
- **Feb 2019** Waymo is averaging about 11,000 miles between disengagements
- **July 2019 Waymo, Google's** former self-driving venture that is now a business under Alphabet, has been given permission by California regulators to transport passengers in its robotaxis



Alphabet's **Waymo** autonomous driving company announced a new milestone at TechCrunch Sessions: Mobility on Wednesday: 10 billion miles driving in simulation.

2017 Forecast – Automation Level 4/5 in 2020
(+ 1 year due to Lidar)

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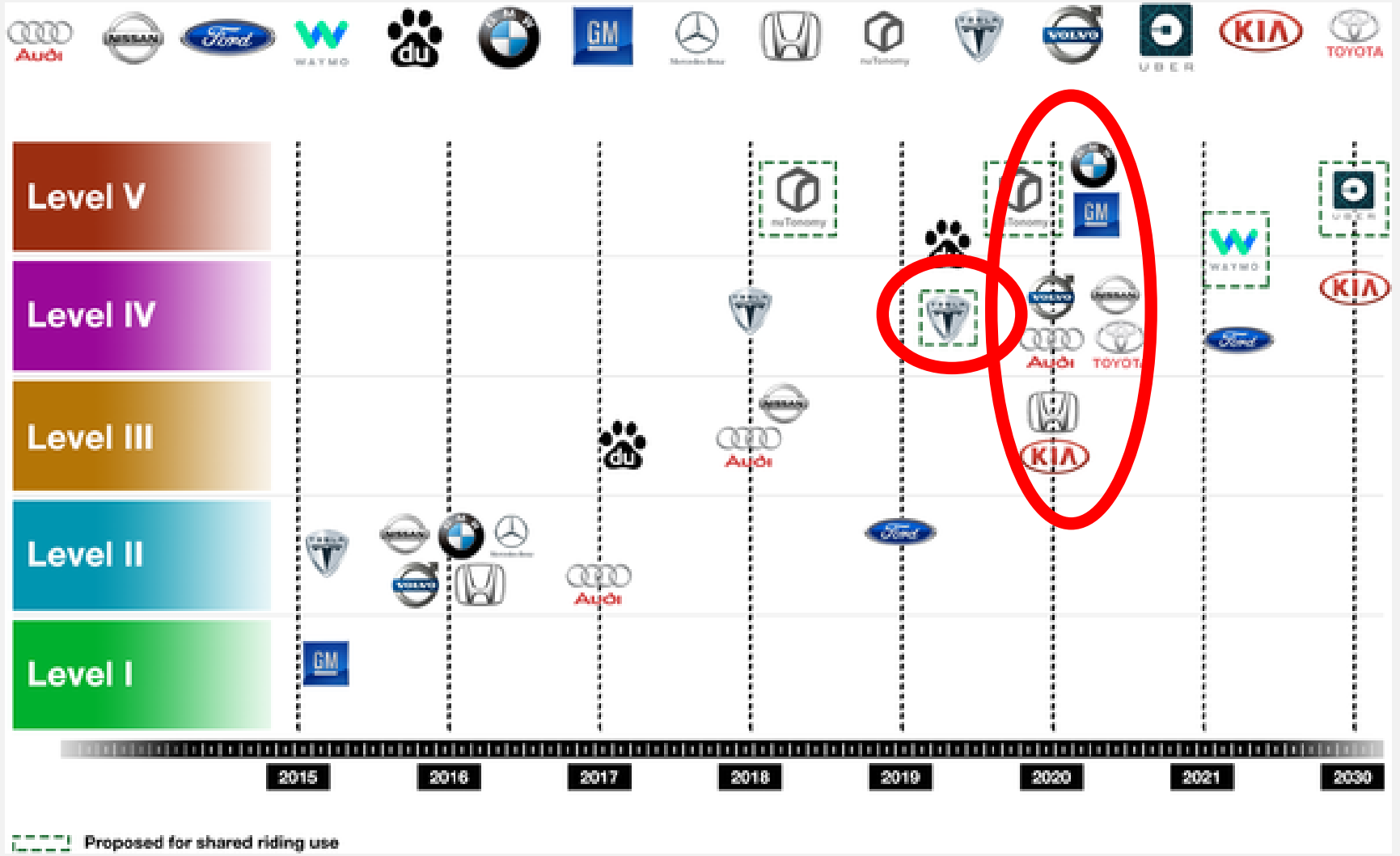

Favarò FM, Nader N, Eurich SO, Tripp M, Varadaraju N (2017) Examining accident reports involving autonomous vehicles in California. PLOS ONE 12(9): e0184952. https://doi.org/10.1371/journal.pone.0184952 https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0184952

PLOS ONE

As at 2018, automated vehicles (L4/5 in 2021)

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(+1 year due to Lidar)….

2018	2019	2020	2021	2022
• Tesla H/O • Volvo H/O • Audi / VW H/O • Hyundai H/O • GMH Level 4 testing • BMW testing Level 4 • Mercedes testing level 5	• Waymo + Jaguar	• Tesla Level 4 • Baidu level 3 • Toyota Shuttle Level 5 • Renault/Nissan test level 4/5	• BMW Level 5 • Mercedes Level 5 • Ford level 4 • Audi/VW Level 4 • Hyundai test level 4/5	• Renault/Nissan Level 4/5

Source: Bloomberg (Translation to levels by presenter)

2018 - Electric Vehicles

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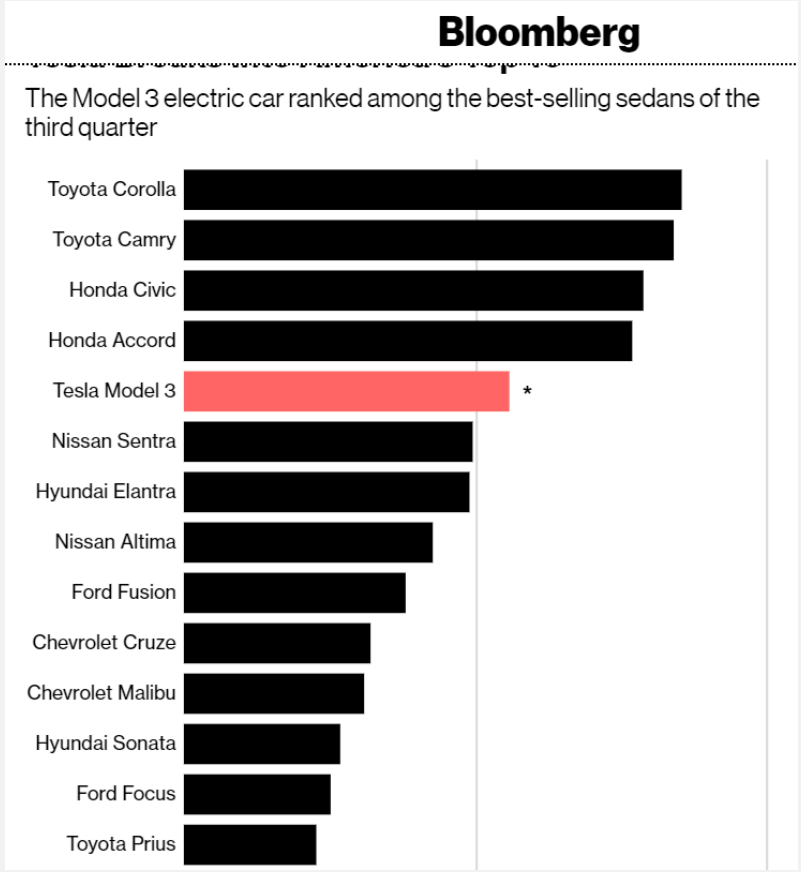
Electric vehicles are not here yet ???

Tesla - 5th largest seller in 2018 USA



Source: Bloomberg October 3, 2018

https://www.bloomberg.com/news/articles/2018-10-03/tesla-s-model-3-is-becoming-one-of-america-s-best-selling-sedans

2019 - Bloomberg - Electric Vehicles Disruption

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"Our latest forecast shows sales of electric vehicles (EVs) increasing from a record 1.1 million worldwide in 2017, to 11 million in 2025 and then surging to 30 million in 2030 as they become cheaper to make than internal combustion engine (ICE) cars. China will lead this transition, with sales there accounting for almost 50% of the global EV market in 2025."

EV costs. The upfront cost of EVs will become competitive on an unsubsidized basis starting in 2024. By 2029, almost all segments reach parity as battery prices continue to fall.

“God Parity” is the rapid change influencer?

6 Multi-disruption Impacts 2024-2028

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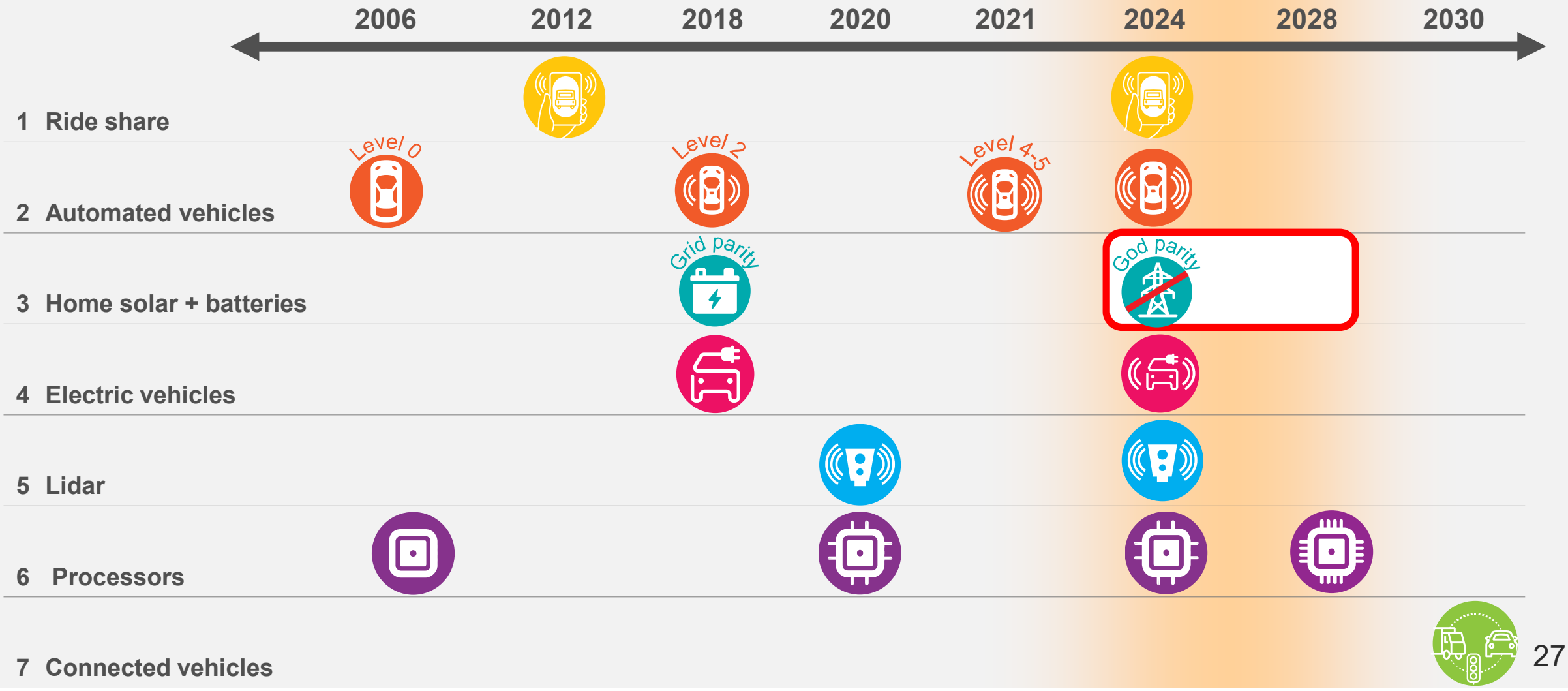

God Parity Influence 2025
[Home Solar + EV] OR [Transmission Power + ICE]

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Cost (2025)	Electric Vehicle (EV)	Internal Combustion Engine Vehicles (ICE)
Purchase	$30,000	$35,000
Life	1,000,000km	250,000km
Running & Maintenance ($/100km)	$7	$39
Network Usage ($/100km)	$3	$3
Home Power Cost / 6 years ($)	$450 (home solar)	$2200 (grid)
Total Cost for 6 years ($)	$10,000 / 6 years	$40,000 / 6 years

Free Car in 6 years
(free charging at home)

Breaking Through for Modern Transport

2030
Disruption 2024-2028

Pre-disruption
10 years
- Safest Road Network Outcome
- Network Safety Plan
- Simple Easy Method
- Registration of Vehicles
- ANCAP
- Licensing of Drivers
- Driver Enforcement
- Vehicles as a Work Place
- Speed management

Post-disruption - Roads
- Cheaper to treat vehicles than roads
- Maximise length for autonomous vehicles
- Sign / marking consistency
- Rain / night visibility
- Sealed roads (asset and safety benefits)
- Vehicle offset from costly safety components

Post-disruption - Vehicles
- All electric vehicles to include latest auto. tech
- Fuel Excise Replacement
- Insurance aligned to risk
- Acceleration and silent – legislation
- Safety assurance system (OEMs)
- Driver aware - AV Mode (Y/N) & Level
- Digital / data sovereignty
- Digital License Opportunities

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Chair Road Safety Task Force
Chair Road Design Task Force
Chair Registration and Licensing Task Force
Austroads Safety Barrier Assessment Panel Subprogram
Support Fed. Government National Strategy

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30 YEARS
COLLABORATION
HARMONISATION
INNOVATION