



Automation & Electrification

Technology Boliden Mines

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Director Technology
Boliden Mines

- **Technology director**,
Boliden Mines since
Aug 2019.
- Project Manager,
Stockholm bypass high
way tunnel, 2018-2019.
- Project Manager,
Repository for spent
Nuclear Fuel,
2010-2018
- Vattenfall Hydro &
Nuclear power,
1999-2010
- Ph.D degree in
Soil & Rock Mechanics,
KTH.

Daniel Eklund



Technology Organisation – Role & Mission

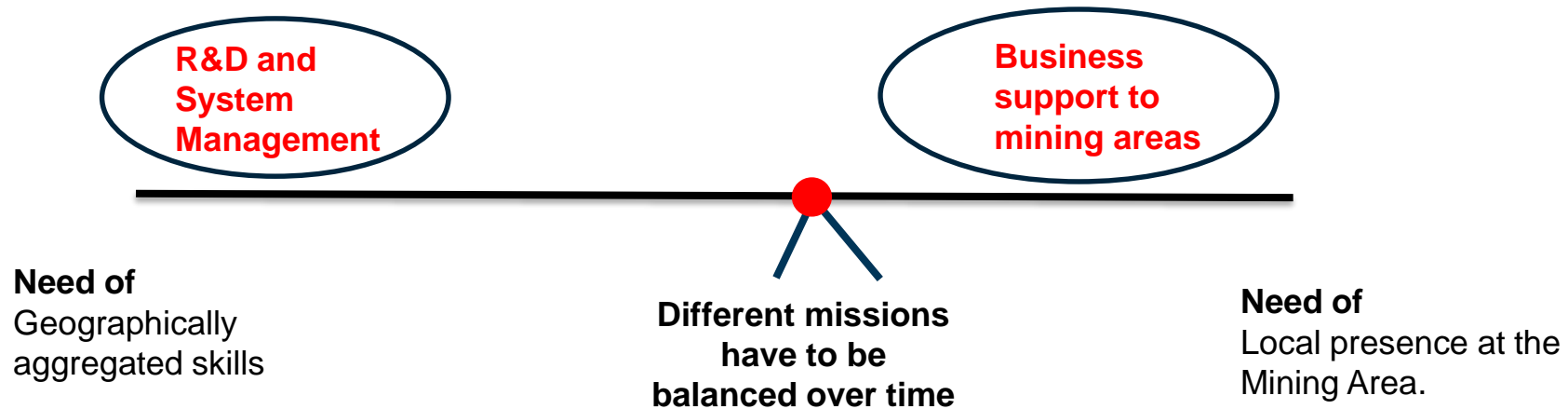


Mission

Knowledge transfer between mining areas and long-term development for the entire business area.

Mission

Value creation for each mining area based on current needs.



Technology is a vital link in the Boliden Mines recruitment and development of engineers and leaders.

Technology Department- R&D



Mining
Technology

System
Technology

Maintenance
Technology

Plant
Engineering

Process
Technology

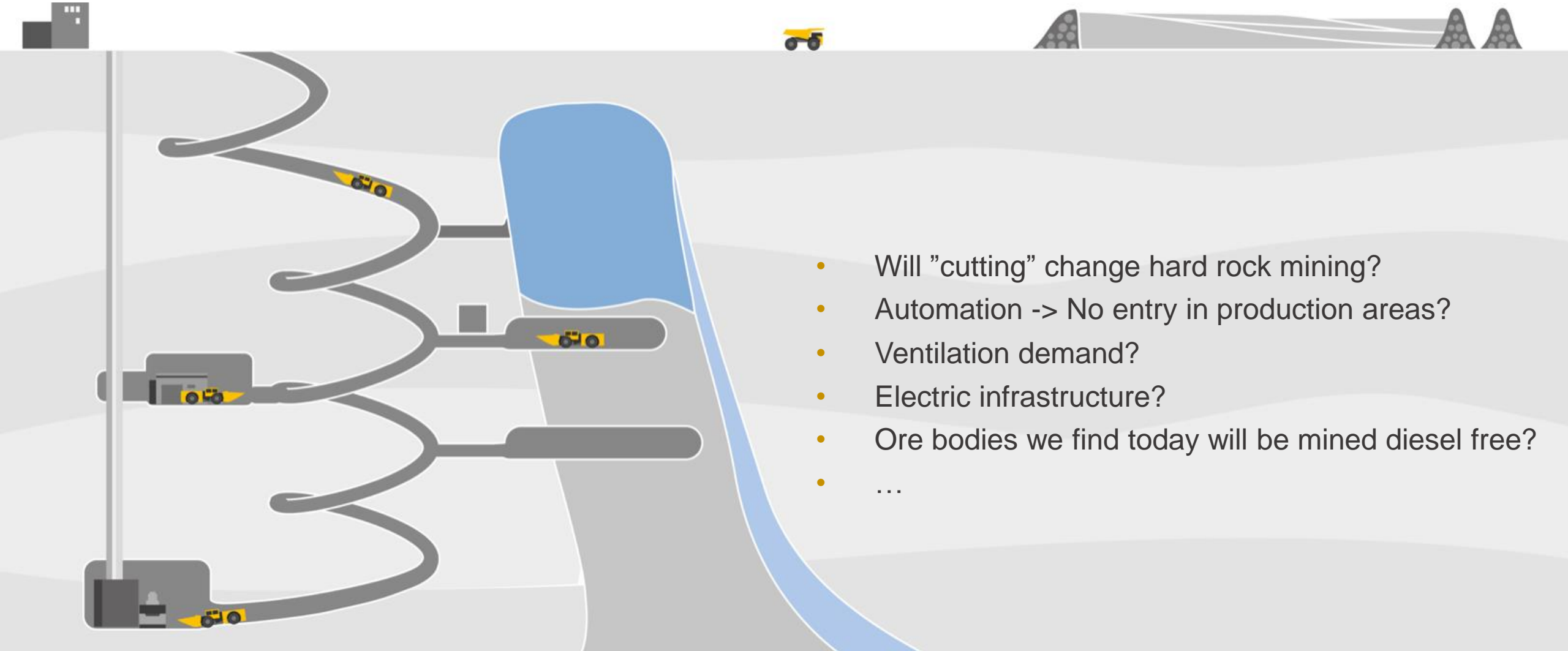
Mine Automation Program

Energy Program

Asset Management Program

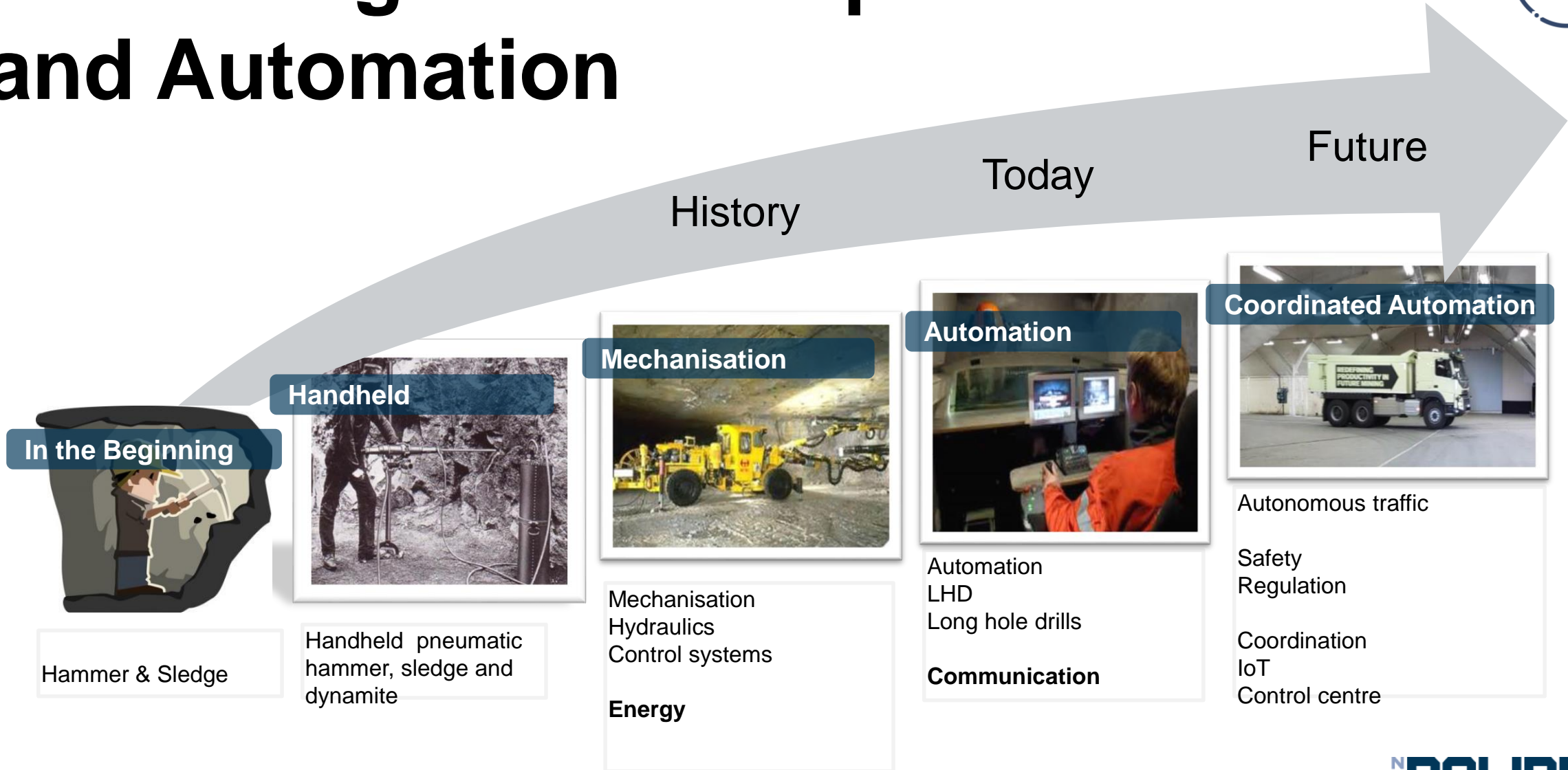
Process R&D Program

Mine of the future?



- Will "cutting" change hard rock mining?
- Automation -> No entry in production areas?
- Ventilation demand?
- Electric infrastructure?
- Ore bodies we find today will be mined diesel free?
- ...

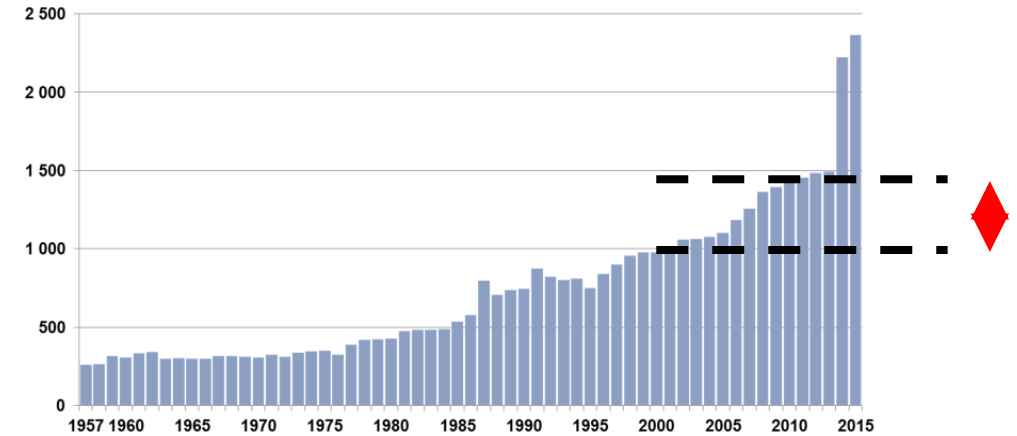
Technological Development and Automation



Why Automation?

- Why not?

Milled production Garpenberg
1957-2015 (tonnes)



Boliden have an extensive experience of automation and process control. During 1998 to 2007 the production in the concentrator in Garpenberg increased a lot without large investments. Why would Mine Automation differ from Automation in concentrators and smelters?

The Vision

- How it was defined when the program was started up 2012

“The automation will move the mine into a continuous process that runs 24/7 with no operator at the production face and full visualization.

The result is:

- **Improved face utilisation**
- **Increased productivity**
- **Higher safety**

That will give us an ability to make profit on ores with lower grades. Boliden will be among the first companies with autonomous equipment giving us the competitive edge to make it possible to expand our mining operation market share with increased profitability.”



How to make it happen?

- 5G testing Ericsson and Telia
- Remote Scaler Jama
- Remote Wheel Loader Volvo CE
- Auto Trucking Sandvik
- Auto Drilling Epiroc
- Ventilation on Demand ABB
- Improved Positioning Mobilaris

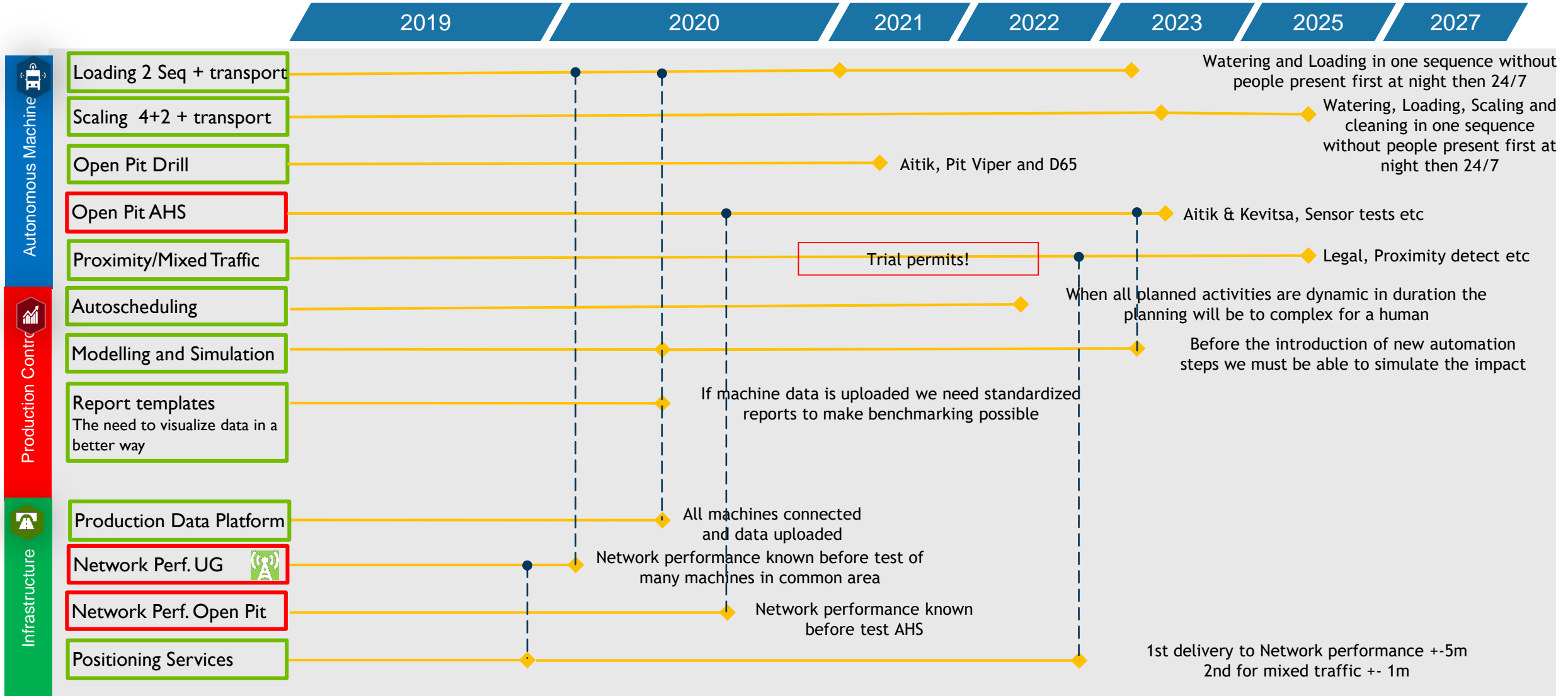
Yes we have a plan!

Started activity

Finished activity

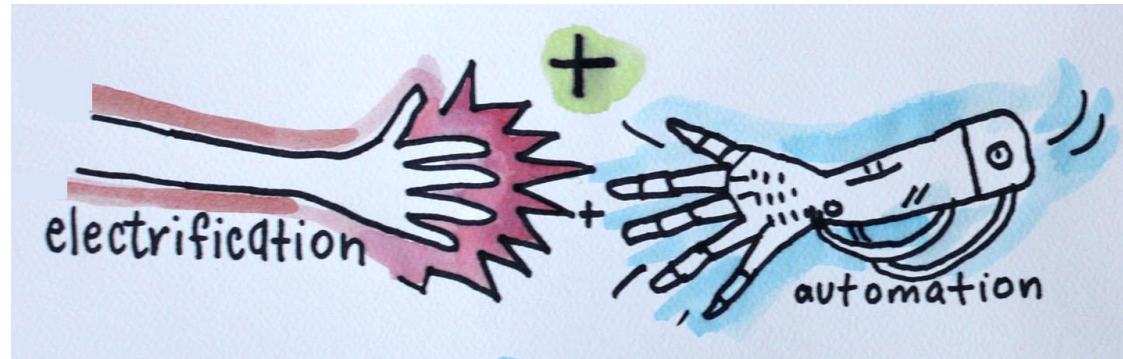
Not started activity

Planned finish



Electrification and Automation

"Hey! Nice to Meet you!"



Fossil free Sweden 2045

Klimatlag (2017:720)

SFS nr: 2017:720

Departement/myndighet: Miljö- och energidepartementet

Utfärdad: 2017-06-22

Ändringsregister: SFSR (Regeringskansliet)

Källa: Fulltext (Regeringskansliet)

1 § I denna lag finns bestämmelser om regeringens klimatpolitiska arbete, vad arbetet ska syfta till och hur det ska bedrivas.

2 § Regeringen ska bedriva ett klimatpolitiskt arbete som

1. syftar till att förhindra farlig störning i klimatsystemet,
2. bidrar till att skydda ekosystemen samt nutida och framtida generationer mot skadliga effekter av klimatförändring,
3. är inriktat på att minska utsläppen av koldioxid och andra växthusgaser och att bevara och skapa funktioner i miljön som motverkar klimatförändring och dess skadliga effekter, och
4. vilar på vetenskaplig grund och baseras på relevanta tekniska, sociala, ekonomiska och miljömässiga överväganden.

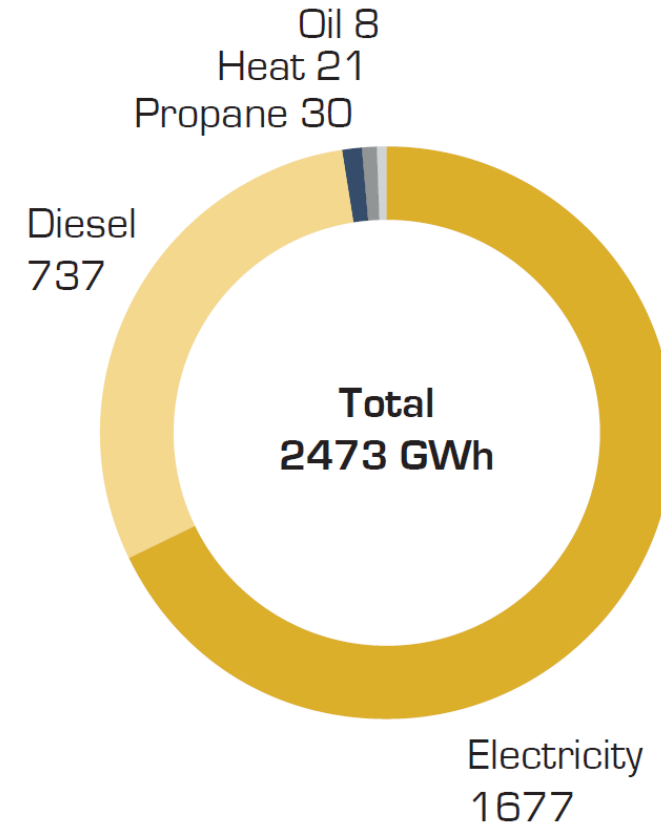
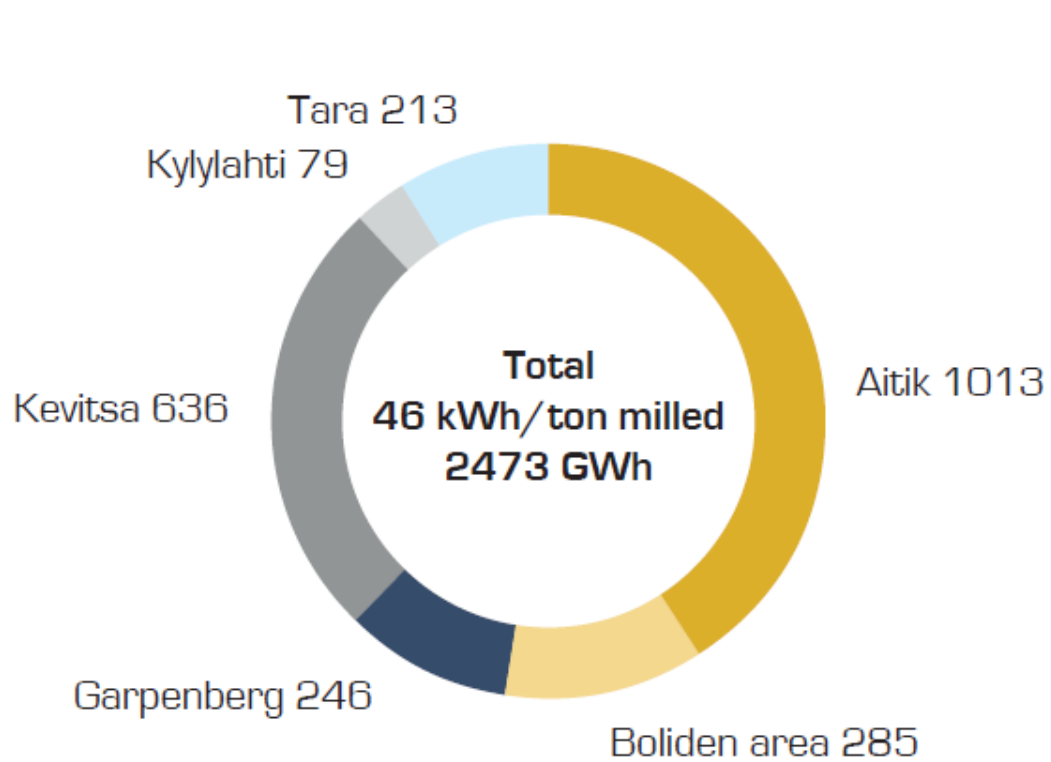
3 § Regeringens klimatpolitiska arbete ska utgå från det långsiktiga, tidssatta utsläppsmål som riksdagen har fastställt.

Low CO₂-footprint metal



How will we lower our CO2-emissions?

Boliden Mines energy consumption



Underground- Battery vehicles



Boliden Mines largest diesel consumer

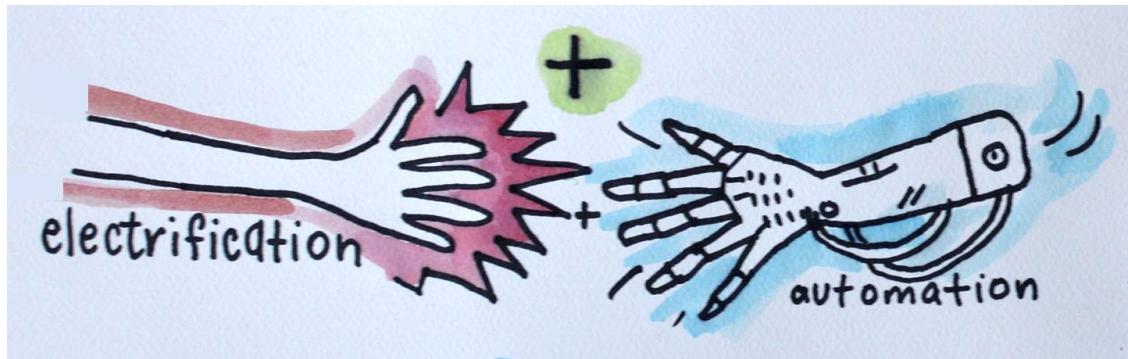






Next step - Electrification

- Boliden are now investing heavily in more trolley lanes in both Aitik and Kevitsa
- In the future one could combine trolley and batteries to achieve a diesel free hauling cycle



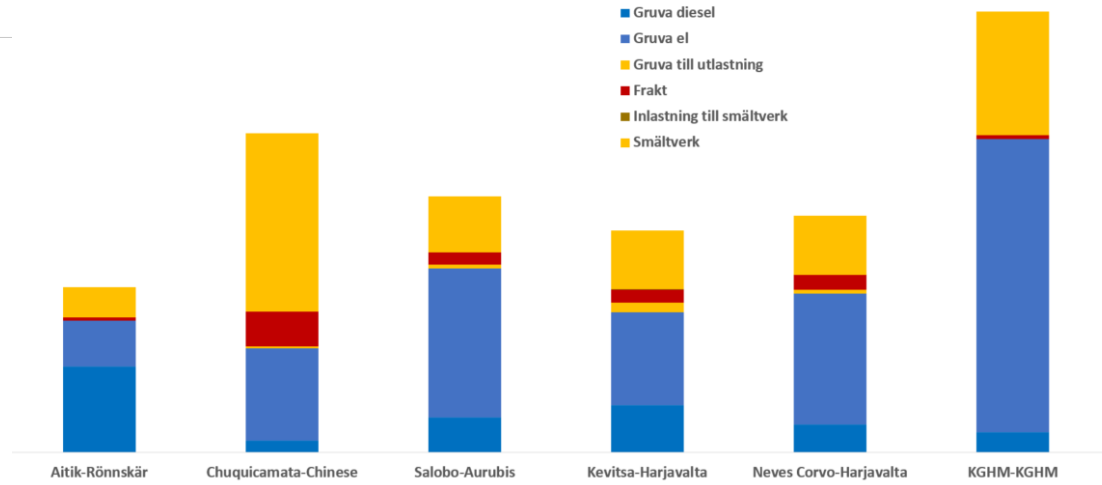
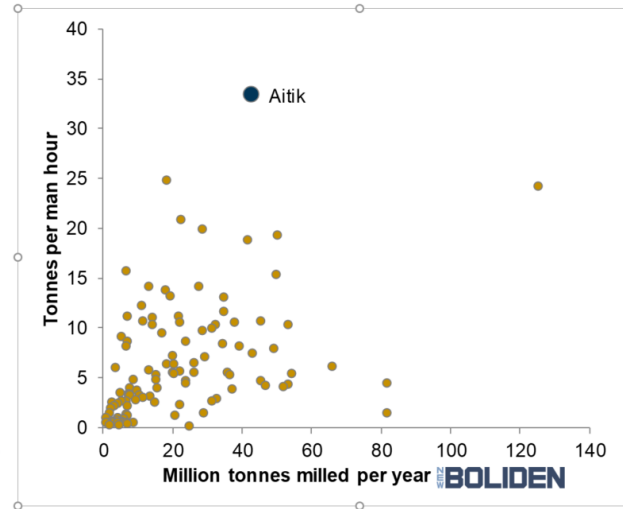
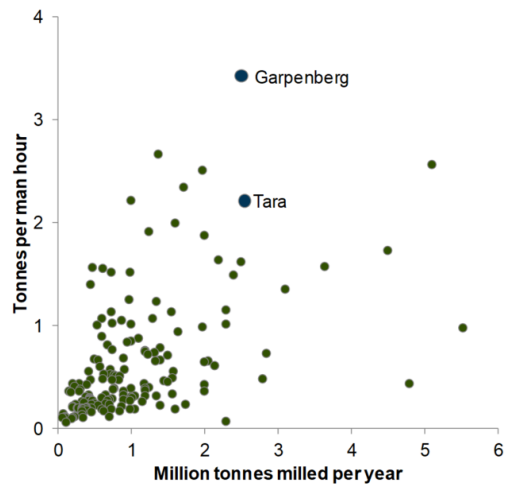
We are already best in class...Why bother?



Carbon / ton Cu

We're best in class

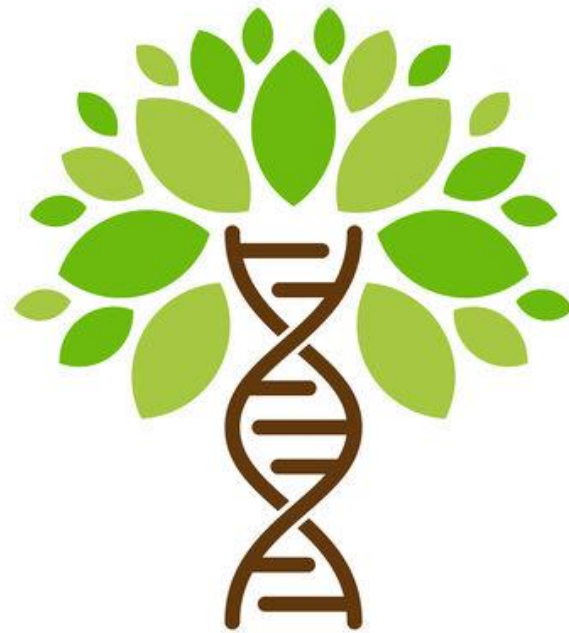
World-class productivity



BOLIDEN

BOLIDEN

It's in our DNA



Our Partners



Our partners are the key to success. When you look at our roadmap, never forget that it is our partners that are doing the bigger part of the investment.