

In Situ Thermal Desorption – How Cold/Heat storage transforms clean-up costs into a sustainable investment

Jan Haemers
TPS TECH SA

Disclaimer

This presentation contains materials related to a patent-pending technology of which Mr Haemers is an inventor. This technology is undisputedly owned by Deep Green SA for all territories except North America and Scandinavia, where ownership is under legal dispute at the Brussels Courts of Commerce.

All presented material in this presentation is publicly available.

The project presented was executed by the company L&C which duly authorized the authors to use their reference.

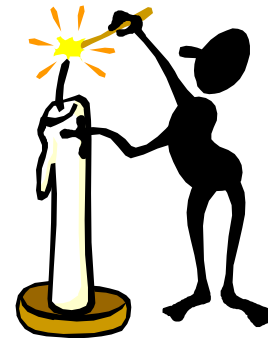
This presentation doesn't commit in any way the company Deep Green, which does not endorse any statements made.

Our view on innovation...



*...by improving
the candle*

*The electric light was not
invented...*



The ambition...

Economical and carbon neutral clean soil through:

- Reduction of energy costs
- Reduction of infrastructure costs
- Savings in (future) expenditures - , like heating/cooling systems

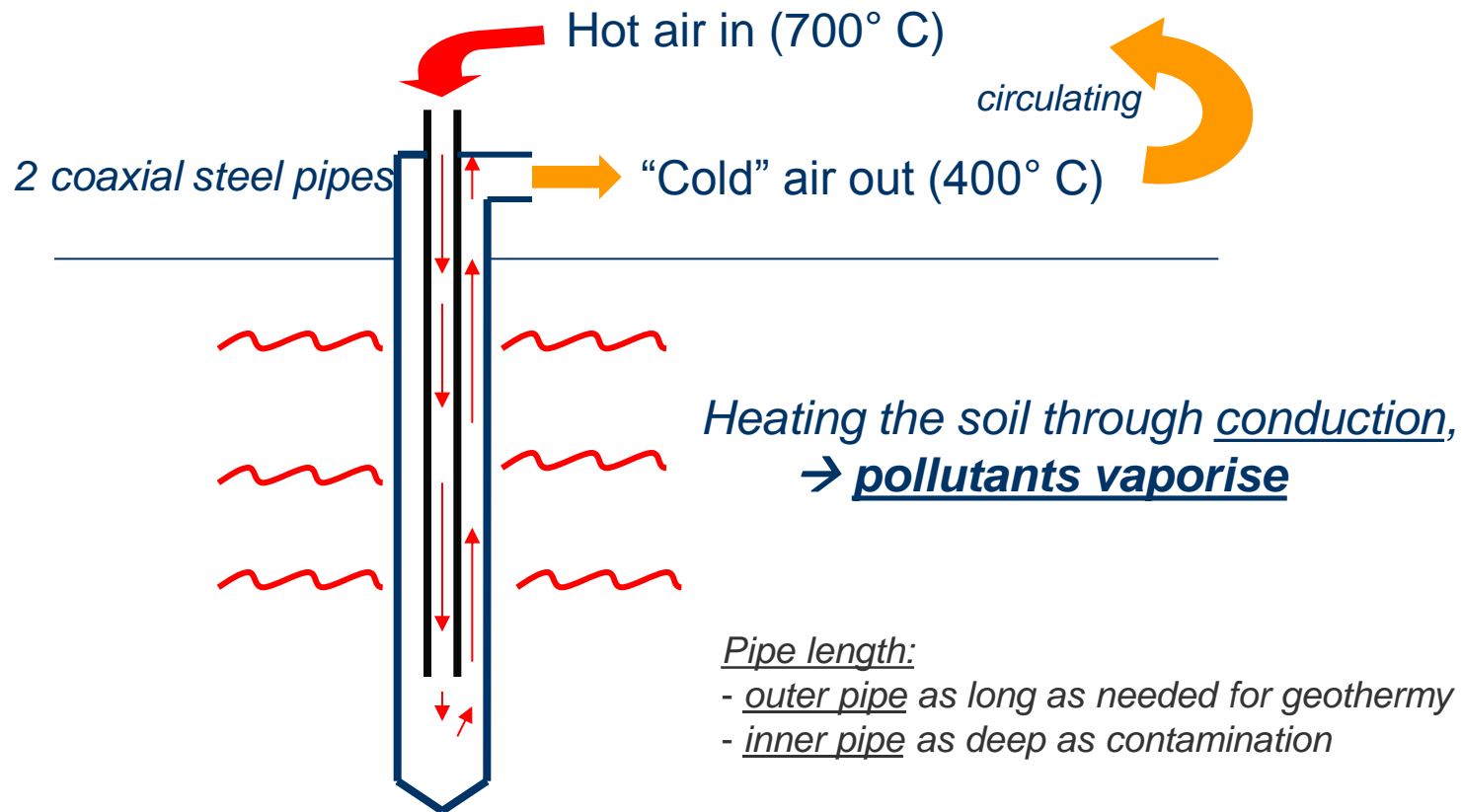
The concept

- **Green:** in-situ thermal treatment of contaminated soil
 - Under existing buildings
 - Brownfields
- **& More:** re-use of ISTD infrastructure for a geothermal system in (future) building (cooling/heating)
- **& More:** re-use of ISTD infrastructure for stability of future building (stakes)

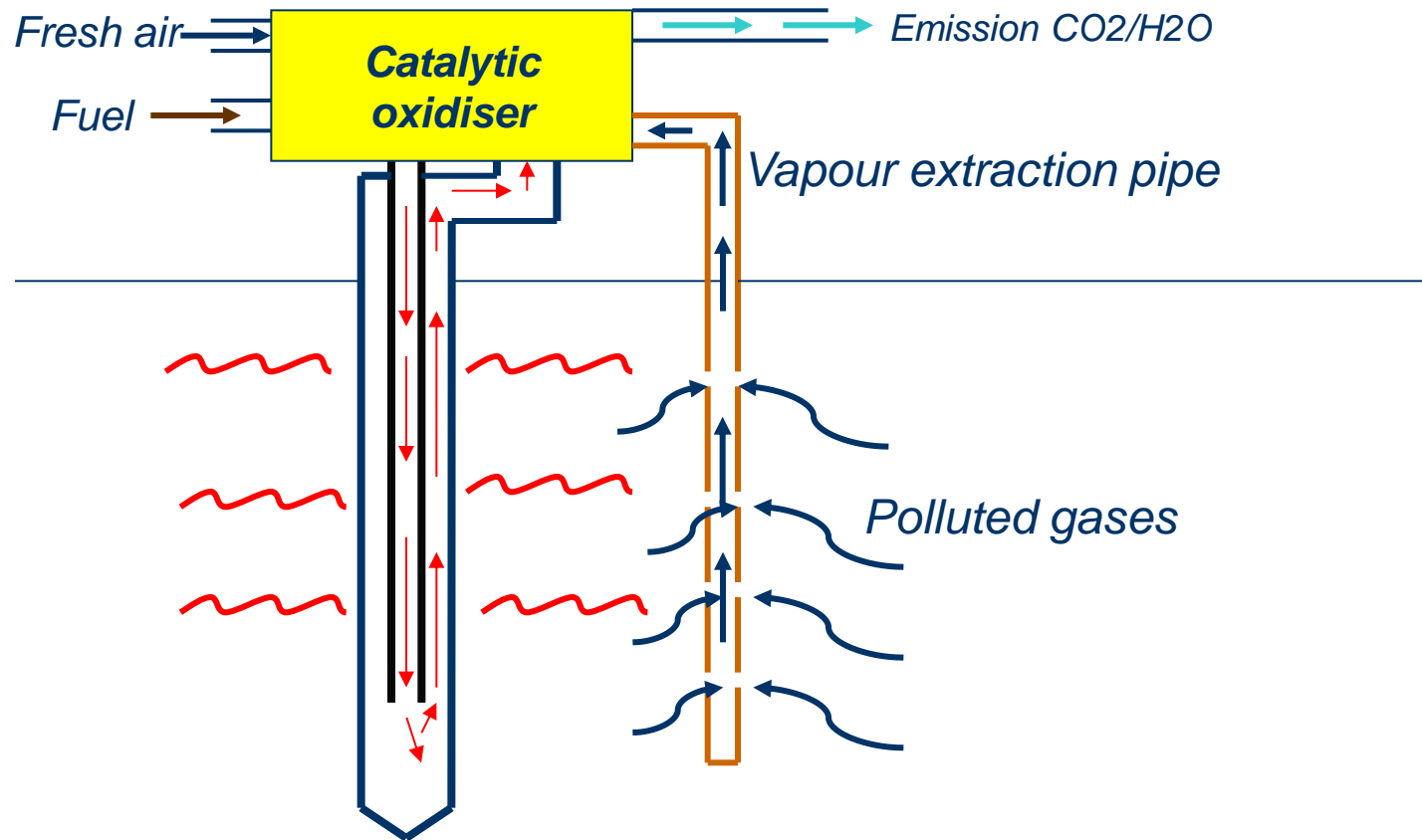
Step 1: Clean soil by ISTD: 2 phases

- Phase 1: heating the soil, to vaporise the pollutants.
Result: clean soil, dirty gases.
- Phase 2: heating the polluted vapors, to destroy the pollutants (oxidisation)
Result: pollutants destroyed; CO₂ and H₂O emission.

Phase 1: Heating the soil



Phase 2: gas treatment

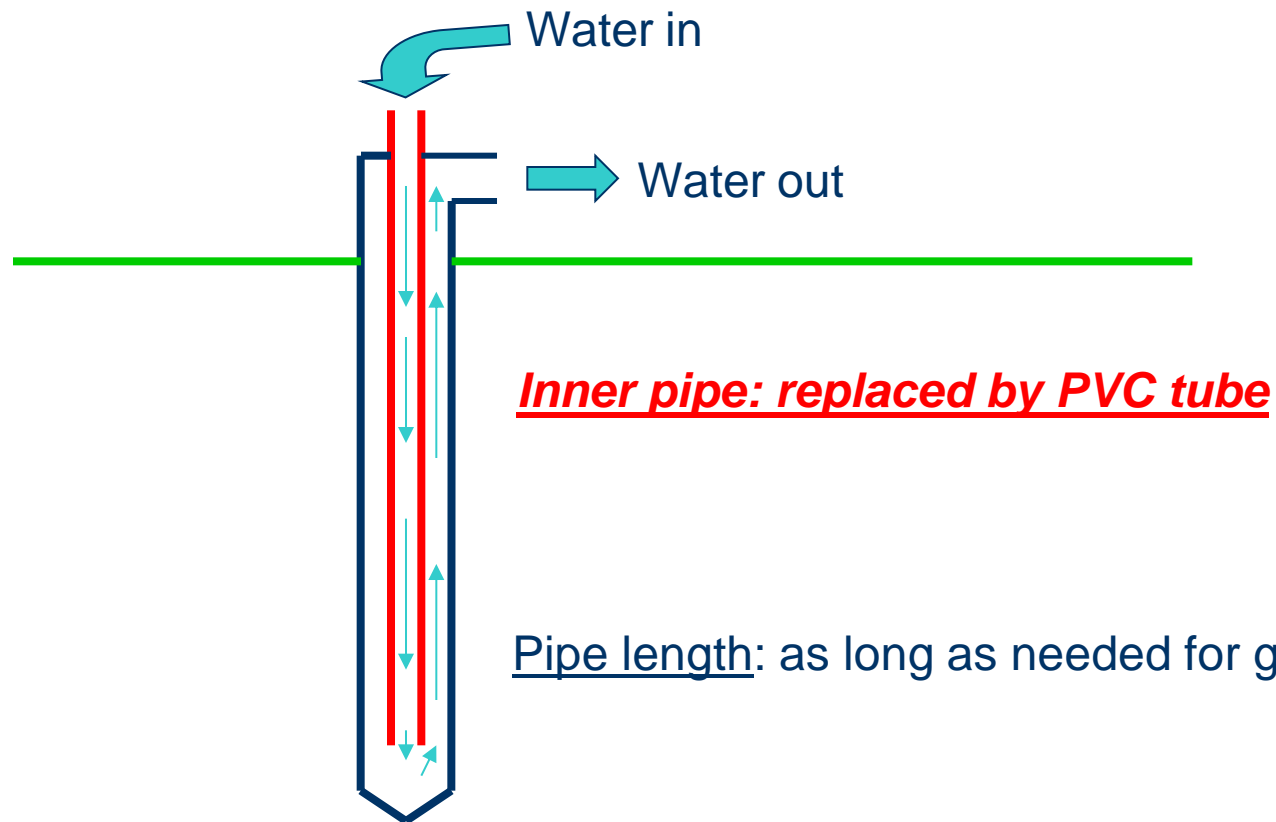


How to define ISTD?

- Installing an air/soil heat exchanger
- Transferring heat to the soil
- Recuperating vapors for oxidation/energy production

And More,...

Re-use for geothermal energy



Savings

- Storage capacity (not energy!)
- Energy comes from
 - Seasonal temperature variations
 - Added solar panels
 - Capped by energy needs of the building

Office or housing?

- Offices
 - Need for cooling (80% of energy consumption)
 - Solar panels not efficient (no extra value)
 - Cooling demand depending on energy efficiency of the building
- Housing
 - Need for heating
 - Extra value in solar panels (more heat can be stored underground)
 - Extra recuperation of clean-up heat (2-3 years)

Critical design parameters

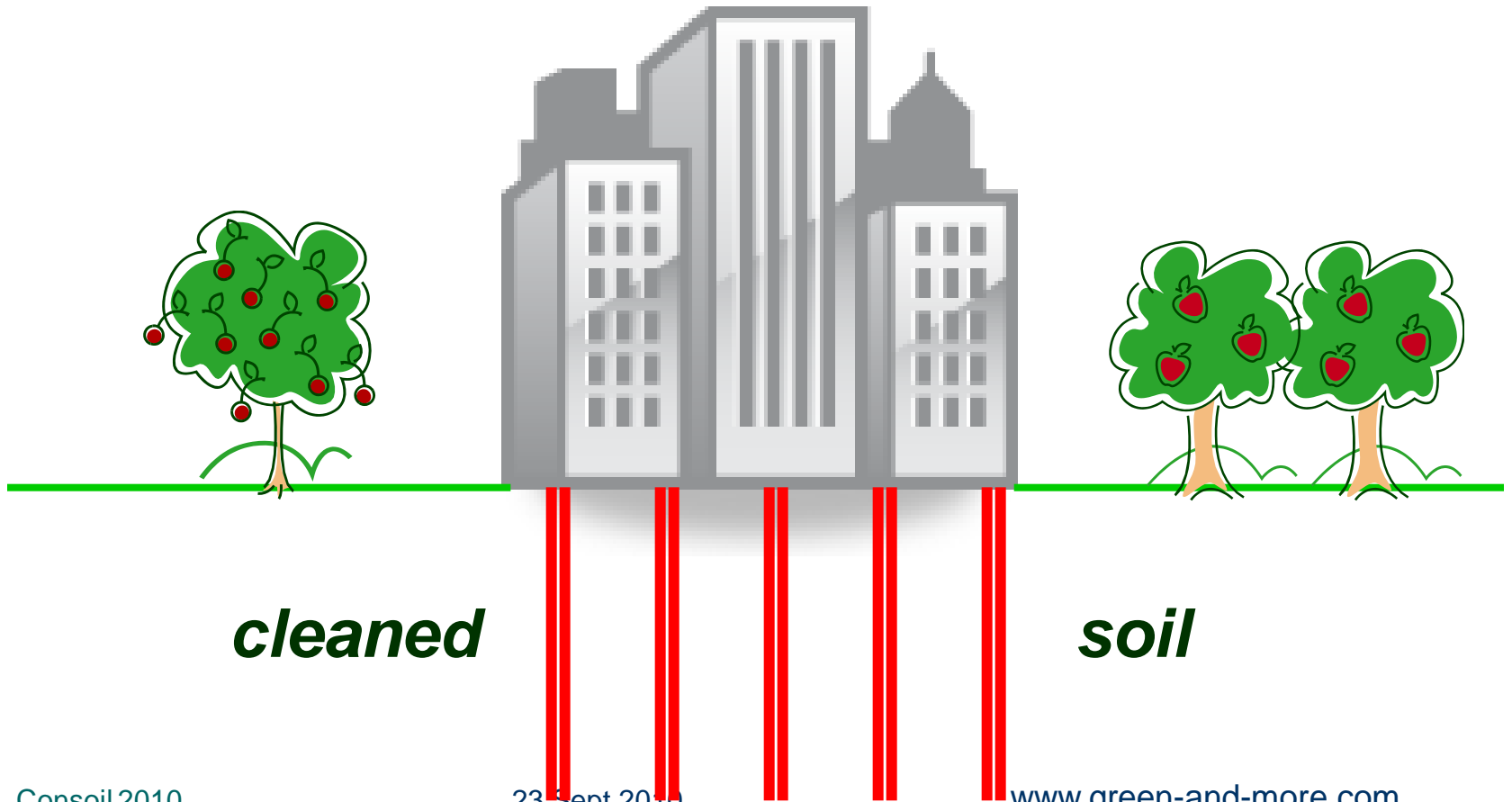
- Energy needs over seasons
- Building usage (office, housing or mixed)
- Design
 - Depth of pipes
 - Surface covered (min is contaminated zone)
- Fixed
 - Interdistance of pipes (depending on clean-up)

Additional benefits

- **Stainless steel pipes**
 - Better thermal conductivity – increase heat transfer efficiency
 - Robust
 - Already installed for remediation
 - Additional cost limited (additional depth)
- **Increase value of the building**
 - Contribution to green building
- **Potential financial benefit from combination**
 - Subsidies for green energy (not for remediation)

And More,...

Stability and geothermal energy



Savings

- Economical
 - Variable, depending on the type of soil, local parameters and construction project.
- Carbon Footprint
 - Transportation and energy related to all stability infrastructure

Conclusion

- Soil pollution is NOT a fatality
- Cleaning can have substantial economic benefits
- Cleaning to natural level is not per definition more expensive
- Widening the thinking can help solving the problem