

THE GREEN ILC

LN₂ Economy

Energy for Innovation and Innovation in Energy

Green ILC Objectives

ILC : lower running cost, better operational flexibility, environment friendly

Revisiting all ILC components:

1. Energy Saving: improving efficiency 80% lost as heat waste
2. Operational saving
3. Energy Recovery and Recycling

Alternative energies:

1. Renewable energy production, best for ILC and ILC site
2. Energy Storage (recovery, intermittency)
3. Distribution and Management: Smart Grid



Energy for: societal needs and world economy,

1. Basic Research
2. Synergies: expertise (SC, magnets, beams, computing), photon, neutron factories
3. Technology innovation
4. ILC as a test bench: Pilot plants for ILC

Global organization for Green ILC

ILC Energy Center

ILC High-Energy
Research Center

Fundamental Research

HEP Applications

ILC Sustainable Energy
Research Center

Basic Research

Application R&D

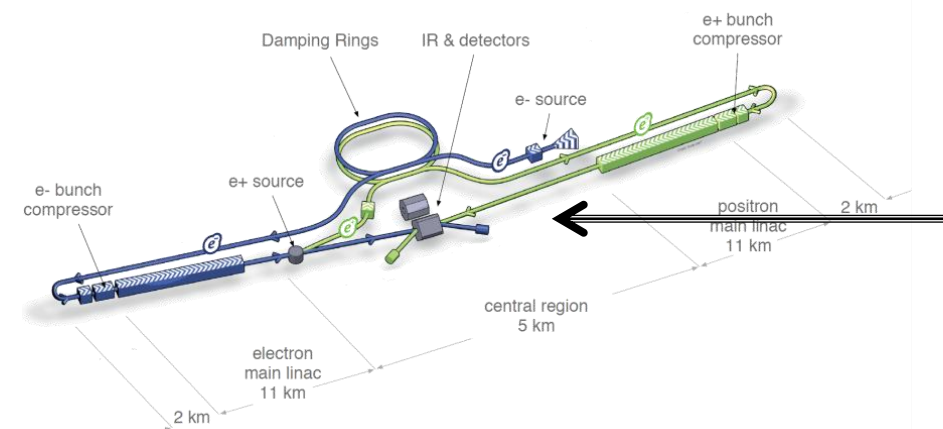
Pilot Power plant for ILC

Industry

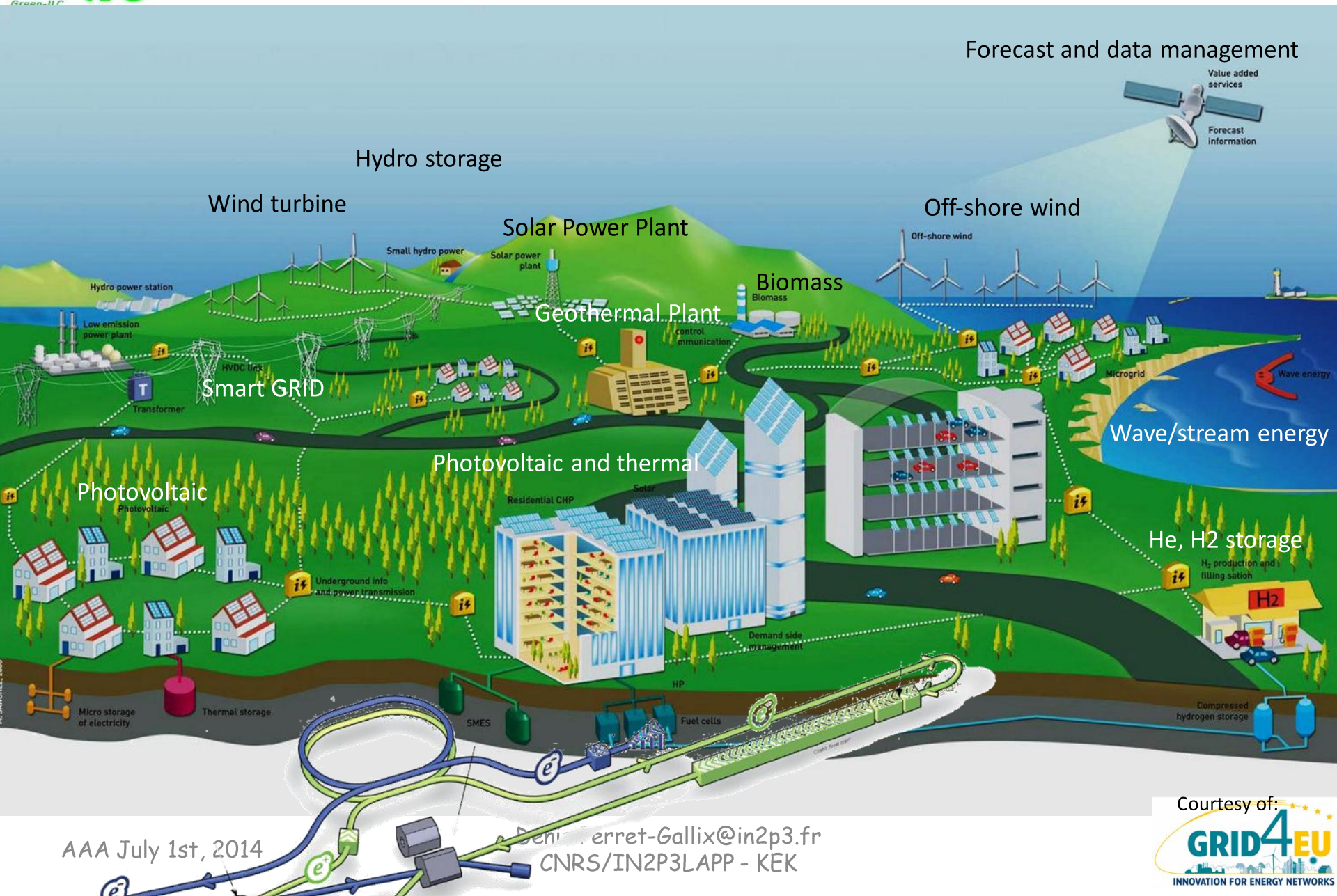
Electrons, photons,
neutrons factories
HPC/GRID Computing

High-Energy community

Energy community



ILC Energy center (artistic) view



AAA July 1st, 2014

Denise Perret-Gallix@in2p3.fr
CNRS/IN2P3LAPP - KEK

Courtesy of:

An LN₂ Economy for ILC

The ILC cryogenics is consuming ~ 40 MW (25% of ILC AC power)

- In current design all cooling is done with LHe. LN₂ as a primary coolant → 20 MW
- LN₂ cooling: HTc (MgB₂) power transmission lines, NC magnets, electronics/computers,
- LN₂ could be used to recycle low grade heat waste (including beam dumps)
- And produce electricity with high-pressure gas turbine

LN₂ could be produced by sustainable energies

- Close to or at the ILC site (wind, solar, geothermal energy)
- Wind energy: from electricity or direct compression

LN₂ Energy storage

- With the heat waste, turbine produce electricity when needed. 70% efficiency



Sumimoto

AAA July 1st, 2014



Denis Perret-Gallix@in2p3.fr
CNRS/IN2P3LAPP - KEK

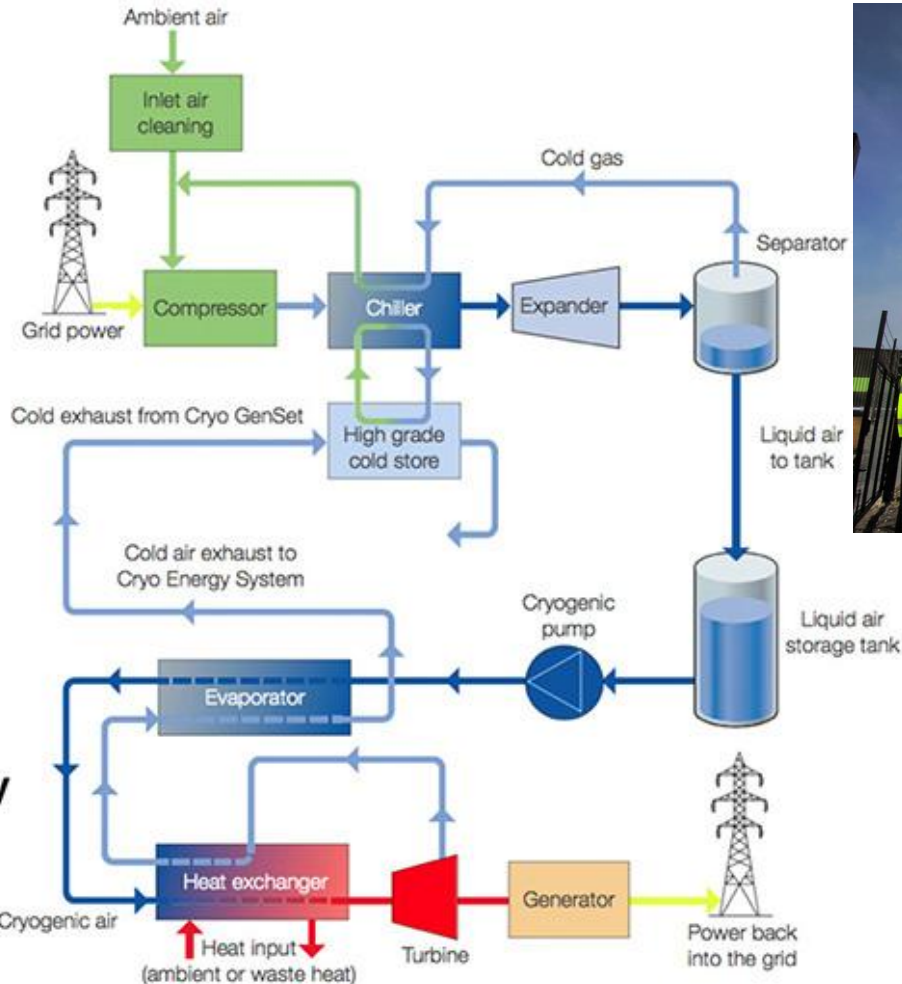
First LN₂ car



Liquid air energy network

LN₂ as energy storage

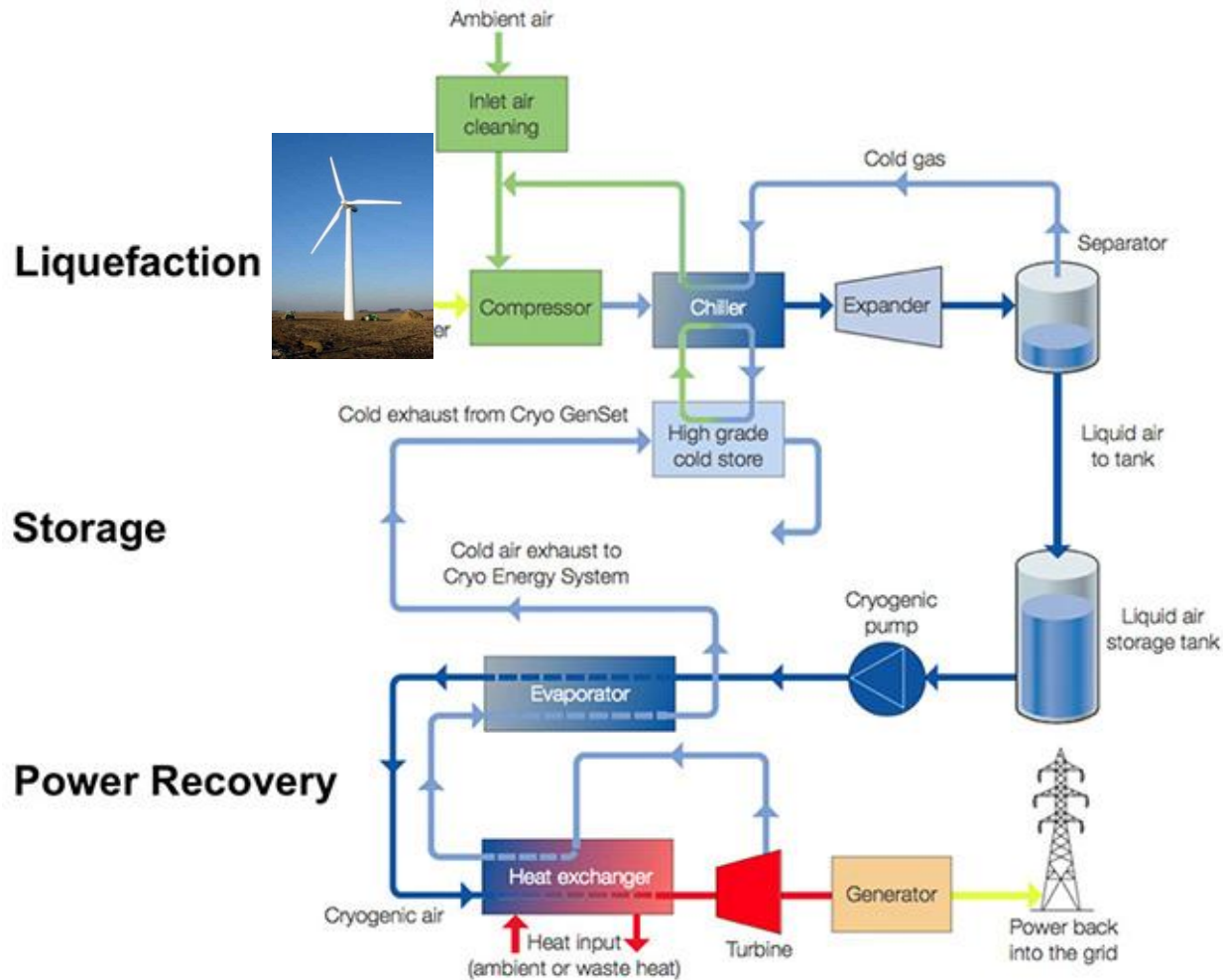
Liquefaction



Highview Power Storage (UK)

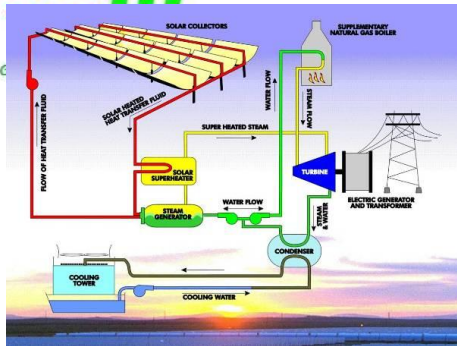
Expected Efficiency up to 70% using heat waste (~ 115 C)

LN₂ from Wind

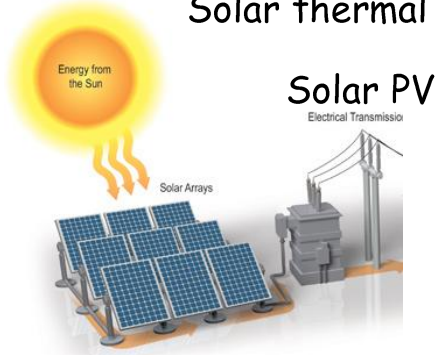




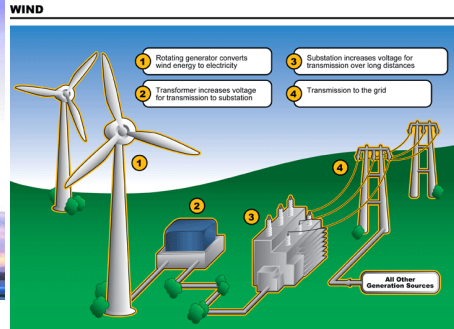
LN₂ Electrical Production and Transport



Solar thermal



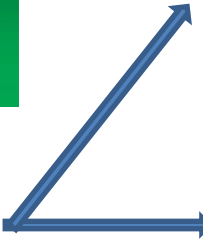
Solar PV



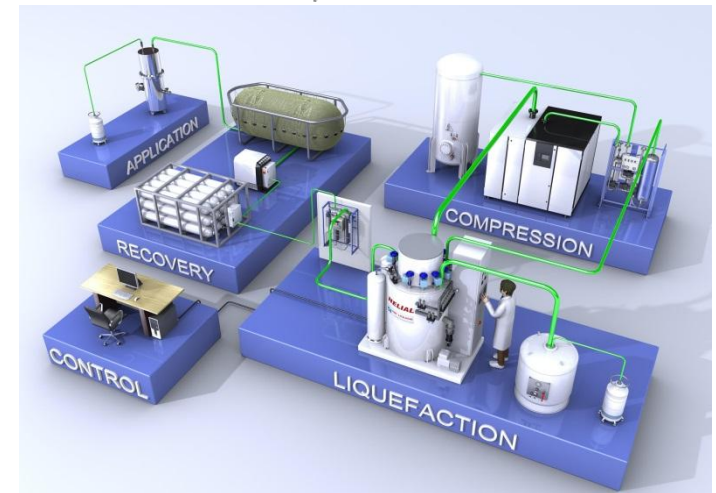
Wind,
Geothermal, biomass

Electricity
OR

Grid/ILC



Make LN₂

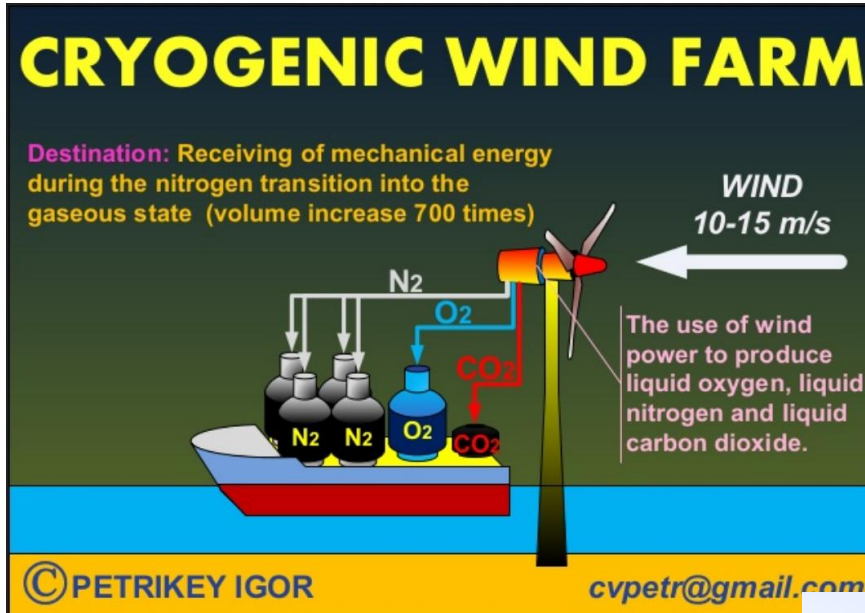


By Cryo Pipeline
Longest LNG ~ 5 km

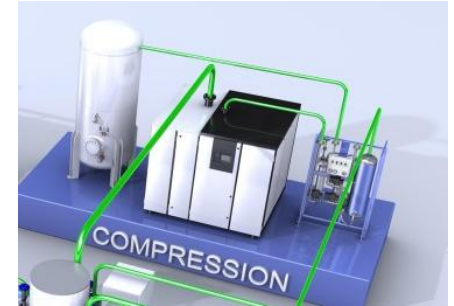
HTc SC power line (project)
by 20 Km long section



LN₂ direct from wind, no electricity ... ???

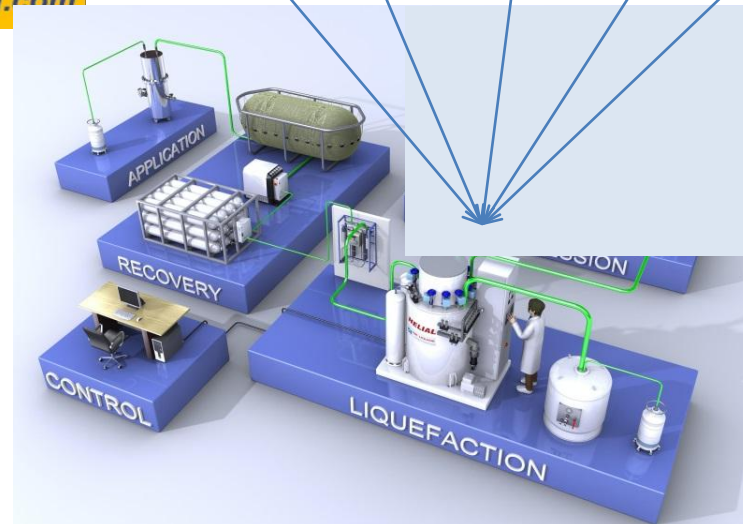


Only compressor in the nacelle



↓

Or ... →



LN₂ process cycle

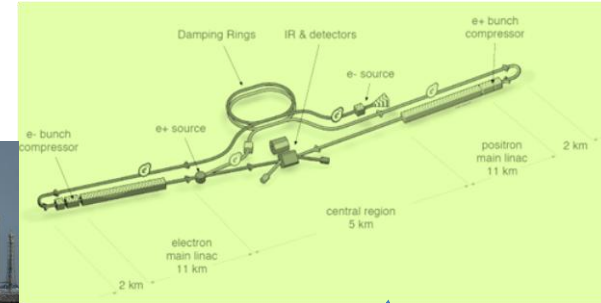
- Cryocooler may save 50% electrical power
- Cooling NC magnets
- HTc power Transmission lines
- Cooling electronics and computers

Compressor/liquefier inside

LN₂



Energy storage

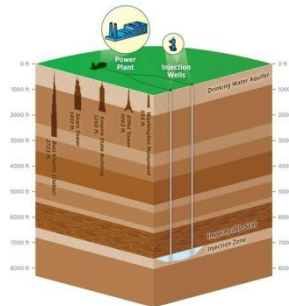


LO₂, LAr, SCO₂ Dry ice



To Industry

For Cooling or Sequestration



Air cleaning !!!

LN₂

heat waste

Turbine → electrical generator

N₂ gas applications

Electricity Back to ILC/GRID

i.e. Drying and preservation industry



LN2 for ILC, just as an example Needs R&D

Many positive aspects:

- Negative (less than zero) carbon emission technology, air cleaner
- Important cryogen for ILC:
 - Cooling: cryocooler, HTc transmission lines, ..
 - Heat waste recovery
 - Storage: 1 gazometer (like for NLG): ILC runs ~ 4 days
 - Fast startup (minutes)
 - Long life-time

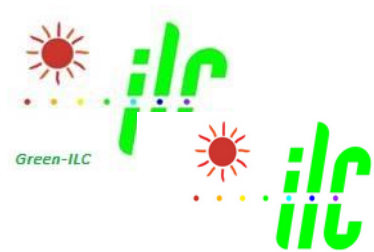
Applications to industry

- Energy Storage
- Heat waste recovery
- Drying

Safety issues, specially in ILC tunnel:

- N2 gas suffocation
- Cryogenic fluid hazard
- LN2 may liquefy ambient oxygen

Other discussions Hydrogen economy



Soon at: Research-up.kek.jp/group/Green-ILC

Green ILC

Energy for Innovation, Innovation in Energy

[Home](#)[Blog](#)[Archives](#)[Energy Saving](#)[Energy Recycling](#)[Sustainable Energies](#)[Contacts](#)

MAR 30TH, 2014

The Green ILC Project

ILC, the International Linear Collider, is the next fundamental science project in high energy physics and the first ever true global basic science center.

What [CERN](#) did for the European HEP community, ILC will do for the world. But the e^+e^- ILC project may go even beyond mere fundamental science and contribute to one of the world most pregnant issue: Energy, not merely high-energy but, more generally: energy for the society.



[Artistic view of the ILC center in Kitakami \(Japan\)](#)

The ILC scientific goal is simple: high precision study of the Higgs particle recently discovered at [LHC](#) (CERN) and other signals LHC could possibly single out. New effects will also be searched for, effects which could have been missed by the LHC due to the heavy background. [Higher precision](#) here concerns, more particularly, the various Higgs couplings, limited at LHC, in part, by the

Recent Posts



Wiki site for Green-ILC internal discussion:

<http://wiki.kek.jp/> Space-> Green-ILC

Confluence Spaces People **Create**

Green-ILC

Pages

Blog

CHILD PAGES

Pages

Green-ILC Home

Overview

+ Create child page

Pages

Green-ILC Home

Created by Operator Admin , last modified by SAEKI Takayuki about 9 hours ago

Welcome to the Green-ILC Project wiki site for sharing content and news with the Green-ILC community.

- Overview

Complete these tasks to get started

- ☐ **Edit this home page** - Click *Edit* in the top right of this screen to customize your Space home page
- ☐ **Create your first page** - Click the *Create* button in the header to get started
- ☐ **Brand your Space** - Click *Configure Sidebar* in the left panel to update space details and logo
- ☐ **Set permissions** - Click *Space Tools* in the left sidebar to update permissions and give others access

Recent space activity

- SAEKI Takayuki**
Green-ILC Home updated about 9 hours ago • view change
- PERRET-GALLIX Denis**
Green-ILC Home updated Jun 27, 2014 • view change
Overview updated Jun 27, 2014 • view change
- Operator Admin**
Green-ILC Home created Jun 11, 2014

Welcome to the Green-ILC space. The editorial members of this space are three people, T. Saeki, D. Perret-Gallix, and H. Hayano. Anyone can add comments on this space. Now please add your comments on this space. (T. Saeki)

Space contributors

- SAEKI Takayuki (8 hours ago)
- PERRET-GALLIX Denis (3 days ago)
- Operator Admin (20 days ago)

Be the first to like this No labels

Space tools

Thank you