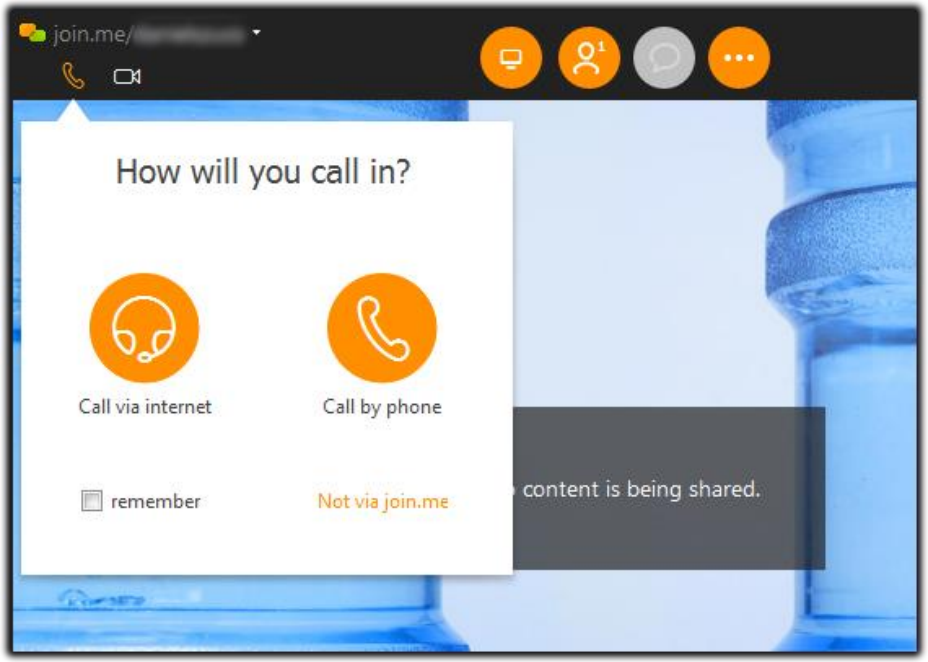
Call-in Info

- Call in via internet or phone for audio



Local Call-in Numbers

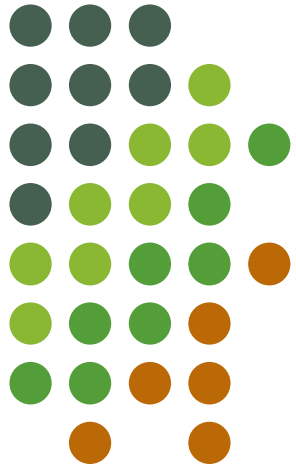
Canada - Brantford+1.226.401.9363
Canada - Charlottetown+1.902.200.0149
Canada - Edmonton+1.587.415.0177
Canada - Montreal+1.514.800.1233
Canada - Ottawa+1.613.699.9318
Canada - Quebec+1.581.705.4251
Canada - Saskatchewan+1.306.400.1019
Canada - Toronto+1.647.977.2648
Canada - Vancouver+1.778.654.8779
Canada - Winnipeg+1.204.500.0399

- **Access Code: #963-150-898#**
- **Mute/Unmute Phone: press *6**

Low-Carbon Resilient Power for Hospitals in the Near Future

The Canadian Coalition for Green Health Care

April 20, 2017



The Canadian Coalition for Green Health Care
Coalition canadienne pour un système de santé écologique

Agenda

Introduction (5 min)

- *Samantha Putoš, BScH, MSc, Sustainable Health Care Programs, Canadian Coalition for Green Health Care*
- *Facilitator: J.J. Knott, CET, CCHFM, CEM, CDSM Healthcare Energy Leaders Ontario (HELO) and Canada (HELC) Projects of the Canadian Coalition for Green Health Care*

Horizon 2020 Prize – Low Carbon Hospital (20 min)

- *Dr. Philippe Schild, Senior Expert, European Commission, Directorate-General Research and Innovation, Renewable Energy Unit.*
- *Q&A*

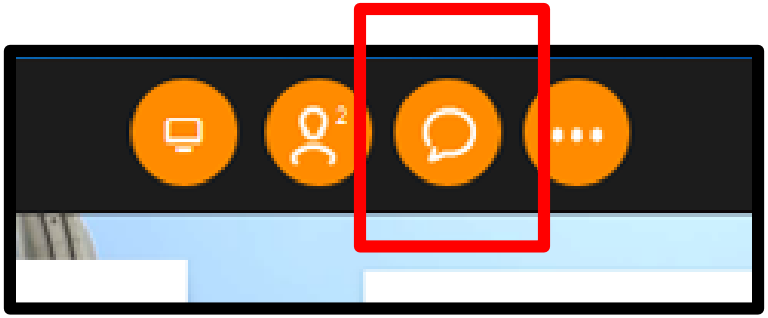
Cogen/CHP in a Post-Carbon Era (20 min)

- *Matt Lensink, B.Eng.Mgt., COO CEM Engineering*
- *Q&A*

Discussion (any remaining time)

Webinar Structure

- Participants will be muted during presentations
- Please use the chat feature to queue questions during the presentation



- Participants unmuted after each presenter for five minutes of Q&A
  - Please use *6 to mute yourself if you are not asking a question

Facilitator

J.J. Knott

CET, CCHFM, CEM, CDSM
Healthcare Energy Leaders Ontario (HELO)
and *Canada* (HELC)
Projects of the Canadian Coalition for Green Health Care

Speaker Introduction

Dr. Philippe Schild

Senior Expert, European Commission, Directorate-General Research and Innovation, Renewable Energy Unit. Philippe has a doctorate in Plasma Physics.

Horizon 2020 Energy Prizes Low Carbon Hospital

Horizon Prize

Philippe Schild
European Commission, Policy officer

Webinar 20/04/2017

Research and Innovation

Outline

- What is Horizon 2020
- What are Horizon 2020 Prizes
- Steps
  - **Rules of the contest**
  - **Submission**
  - **Awards**
- Opportunities of Prizes in the « Energy Challenge »
- Why this prize
- The prize itself

What is Horizon 2020?

- ***€70 billion research and innovation funding programme (2014-2020)***

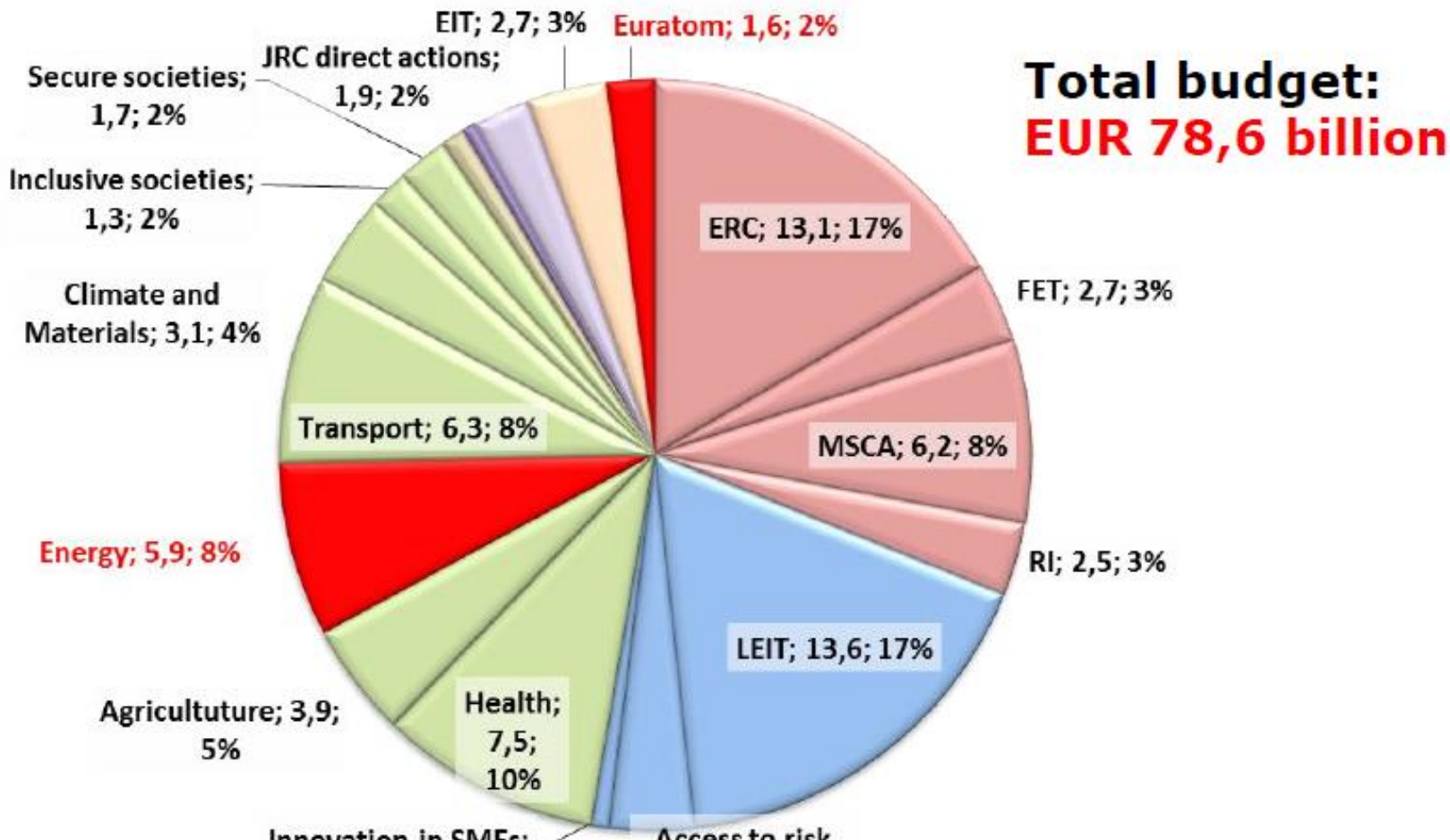
- ***A core part of Europe 2020, Innovation Union & European Research Area:***
  - *Responding to the economic crisis to invest in future jobs and growth*
  - *Addressing people's concerns about their livelihoods, safety and environment*
  - *Strengthening the EU's global position in research, innovation and technology*

Three priorities

European Commission

European Commission

Horizon 2020 - Budget allocation (2014-2020, bn €)



Research and Innovation

European Commission

Energy Challenge - main challenges

Support the transition to a reliable, sustainable and competitive energy system

- Reducing energy *consumption* and *carbon footprint*
- Boosting development of *renewable and alternative energy* technologies and their *integration in the energy system*
- Making the *grid* more flexible (inclusion of new energy sources, lowering costs of necessary infrastructure upgrades)
- *Decarbonising* the power and other industrial sectors

Increase the competitiveness of European industry

- Addressing the whole *supply chain*
- Increase *energy efficiency* in industry, decrease energy costs

Building a European Research Area in the field of energy

- *Coordinating research activities* of Member States, Associated States and Regions (promoting SET-Plan)

European Commission

What are Horizon 2020 Prizes

- "**Challenge**" or "**inducement**" prizes, offering a cash reward to whoever can most effectively meet a defined challenge

- incentive for innovation by prescribing the goal, but not how the goal should be achieved

Research and Innovation

European Commission

Steps

- **Rules of The Contest**
- **Submission of Applications**
- **Evaluation and Awards**

Research and Innovation

European Commission

Rules of The Contest

- One per prize
- Deadlines
- Eligibility
- Award criteria
- Procedure

Research and Innovation

Submission of Applications

- **Online tool (SEP) : Open since 05/07/2016 [for our energy prizes]**
- **Standard Part A for the consortium**
- **Part B: specific per prizes**

Evaluation and Awards

- **After the deadline:**
  - **Eligibility checks**
  - **Evaluation by Jury following the award criteria**
    - **Possible site visit:**
      - » **Hospital using 100% renewable energy sources**
- **Award given in a ceremony**

European Commission

Opportunities of Prizes in the « Energy Challenge »

- To stimulate innovation and come up with solutions to problems that matter to European citizens

- To contribute to the objectives of both the Energy Union and the Strategy Energy Technology Plan. To boost innovation leading to greater **sustainability and efficiency**, while increasing our **energy security** and supporting the **decarbonisation** of the European economy.

Research and Innovation

Title	Budget (EUR million)	Publication of the contest	Submission of candidatures by
CO2 reuse in innovative products	€1.5	5 July 2016	3 April 2019
Low carbon hospital Combined Heat and Power installation in a hospital using 100% renewable energy sources	€ 1.0	5 July 2016	3 April 2019
Photovoltaics meets history Integrated Photovoltaic Energy System in a European protected historic urban district	€ 0.75	5 July 2016	26 September 2018

European Commission

Why a prize for « hospital »

- Hospitals matter to citizens
- Energy requirements for hospitals are critical
- To demonstrate that renewable energy is a viable technology option

The ideas behind the prize for « hospital »

- Combining different renewable technologies and storage and ALL the energy needs through costumer/consumer needs

- Be visible through the size of the energy system, medium size hospital (~175 beds), and impacts

- Award criteria: focus on technology and operation performance, cost and public acceptance

European Commission

The Prize for « hospital »

Research and Innovation

Horizon Prize LOW CARBON HOSPITAL

#HorizonPrize

Horizon prize for Combined Heat and Power (CHP) installation in a hospital using 100% renewable energy sources

- **The challenge:** To develop an innovative renewable energy solution integrating **at least three** European technologies renewable into one energy system in a hospital, while ensuring a 100% secure energy supply.
- **€1 million reward** to **a hospital** for innovative solution integrating several technologies into one energy system, which can guarantee uninterrupted energy supply.

Research and Innovation

European Commission

The contestant / the winner

- The contest is open to all legal entities (including natural persons) or groups of legal entities **owning or operating a hospital**, in the premises of which the requested application will be installed
- This installation has to use at least three different **European renewable energy technologies** - developed and produced in a Member State of the EU or in a country associated to Horizon 2020 programme.

Horizon Prize LOW CARBON HOSPITAL

#HorizonPrize

Horizon prize for Combined Heat and Power (CHP) installation in a hospital using 100% renewable energy sources

ELIGIBILITY:

The contestant: all legal entities (including natural persons) or groups of legal entities regardless of their place of establishment **owning or operating a hospital**, in the premises of which the requested application will be installed.

A **new** combined heat and power system integrating at least **three different European renewable energy technologies**, with an **energy storage component**

>2.000.000kWHe

100% of the energy need

> 6 months of operation

Research and Innovation

European Commission

- **Award Criteria (100):**
  - A **new** CHP system **(20)**
    - **>2.000.000kWhe (5)**
    - **> 3700h operation (5)**
    - **> Innovative storage solution (10)**
  - Reliability, easy maintenance and safety of operation **(20)**
  - CO2 emission reduction and sustainability aspects, potential energy savings **(20)**
  - Minimal/non-invasive impact on premises **(10)**
  - Low operation and maintenance costs **(20)**
  - Involvement of public **(10)**

European Commission

THANK YOU!

Horizon Prize

- EC-PHOTOVOLTAICS-PRIZE@ec.europa.eu
- EC-LOWCARBON-PRIZE@ec.europa.eu
- EC-CO2REUSE-PRIZE@ec.europa.eu

Research and Innovation

Speaker Introduction

Matt Lensink

Matt has developed 12 biogas-based combined heat and power (CHP) facilities throughout Canada. He is the Chief Operating Officer(COO) with CEM Engineering and is responsible for the development and schematic design of natural gas fired cogeneration projects for industrial and institutional clients. Matt has a Bachelors of Mechanical Engineering and Management from McMaster University.

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Canadian Coalition for Green Health Care

CAN CHP/COGEN EXIST IN A POST-CARBON ERA??

Prepared By:
Martin Lensink, P. Eng.
Principal-In-Charge

Presented By:
Matt Lensink, P. Eng.
Chief Operating Officer

April 20, 2017

OVERVIEW

1. Tutorial – Non-Fossil Fuels
2. CHP Technologies to Utilize These Fuels
3. Examples
4. Recommendations

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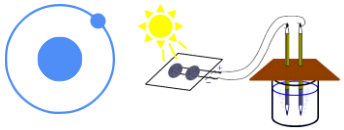
GASEOUS FUELS

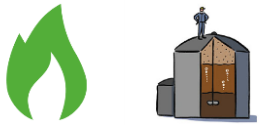
(LESS CARBON IMPACT)

RENEWABLE NATURAL GAS
Mixture of Biogas and Natural Gas

RENEWABLE NATURAL GAS
Mixture of Hydrogen and Natural Gas



HYDROGEN
"Power-to-Gas", via electrolysis



BIOGAS
Via Anaerobic Digesters

SYNGAS
Via gasification of clean biomass

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LIQUID & SOLID FUELS

(WITH LESS CARBON IMPACT)

BIODIESEL

Vegetable Oil/Fatty Acid Ester

ETHANOL

Produced from agricultural feedstocks

METHANOL

If made from woody biomass (via pyrolysis)

CLEAN BIOMASS

Direct combustion, producing “high grade” clean, hot air

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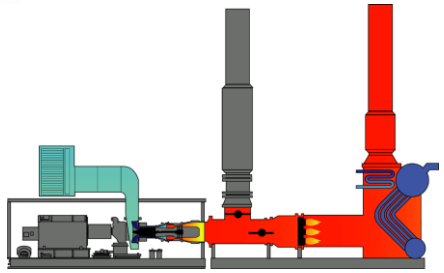
CHP Technologies to Utilize These "Carbon-Neutral" Fuels

- **Internal Combustion Engines:**
  - Some can burn gaseous fuels
  - Some can burn liquid fuels

- **Combustion Gas Turbine Generators**
  - Some can burn very high and rich fuels (hydrogen)
  - Some can burn very low Btu fuels (biogas)



- **Organic Rankine Cycle**
  - Can convert hot air from combustion of biomass to electricity

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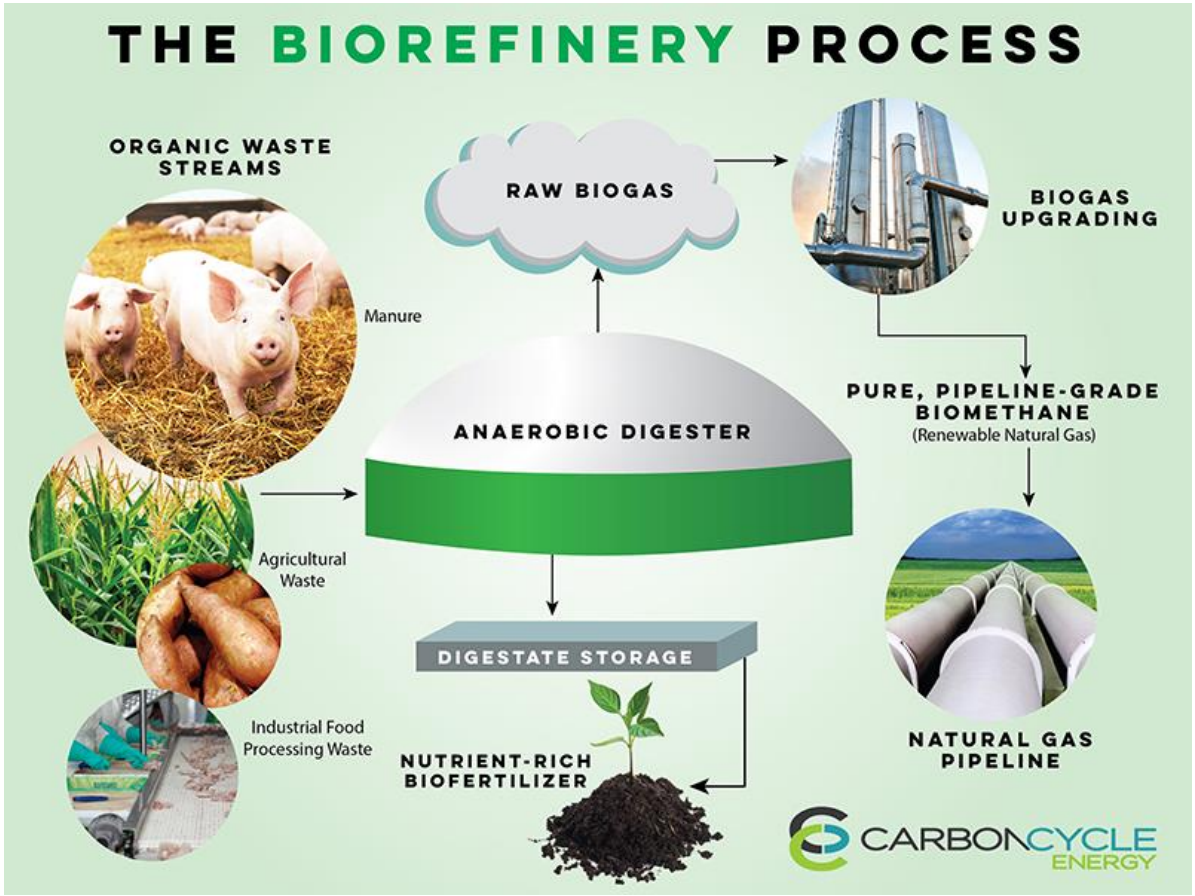
RENEWABLE NATURAL GAS



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POWER-TO-GAS

New Pathways for Bulk Energy Storage and Conservation

Power-to-Gas and CHP can be leveraged for integration of surplus renewables into thermal & power grids

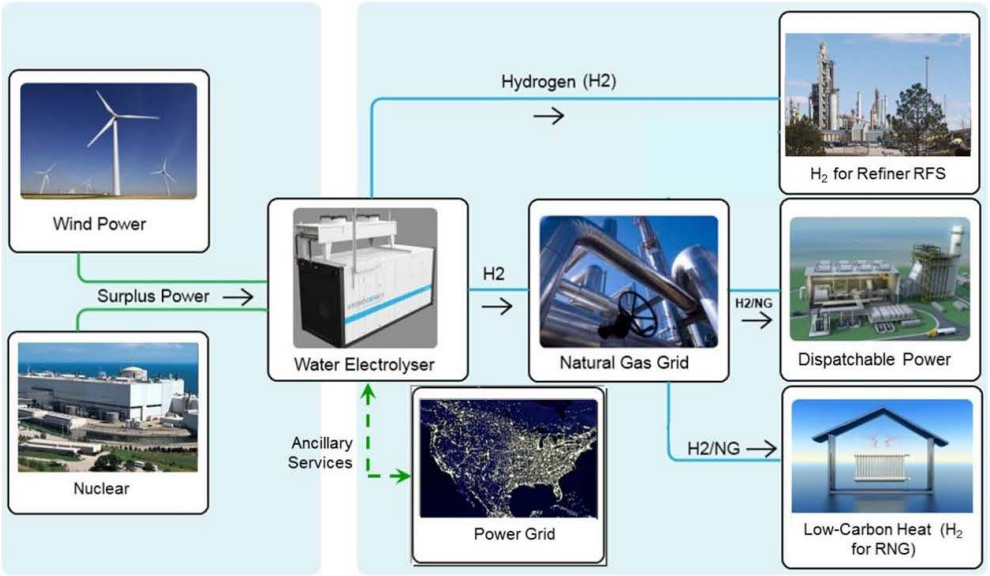

Image Source: Hydrogenics

1. Power-to-Gas links electricity & natural gas networks for bulk storage of low-C energy
2. Alternative inter-tie for the power grid; optimize surplus for Ont. competitive advantage
3. Green gas can be blended in gas distributor rates to further improve carbon reductions from CHP / other end-uses

10

ENBRIDGE

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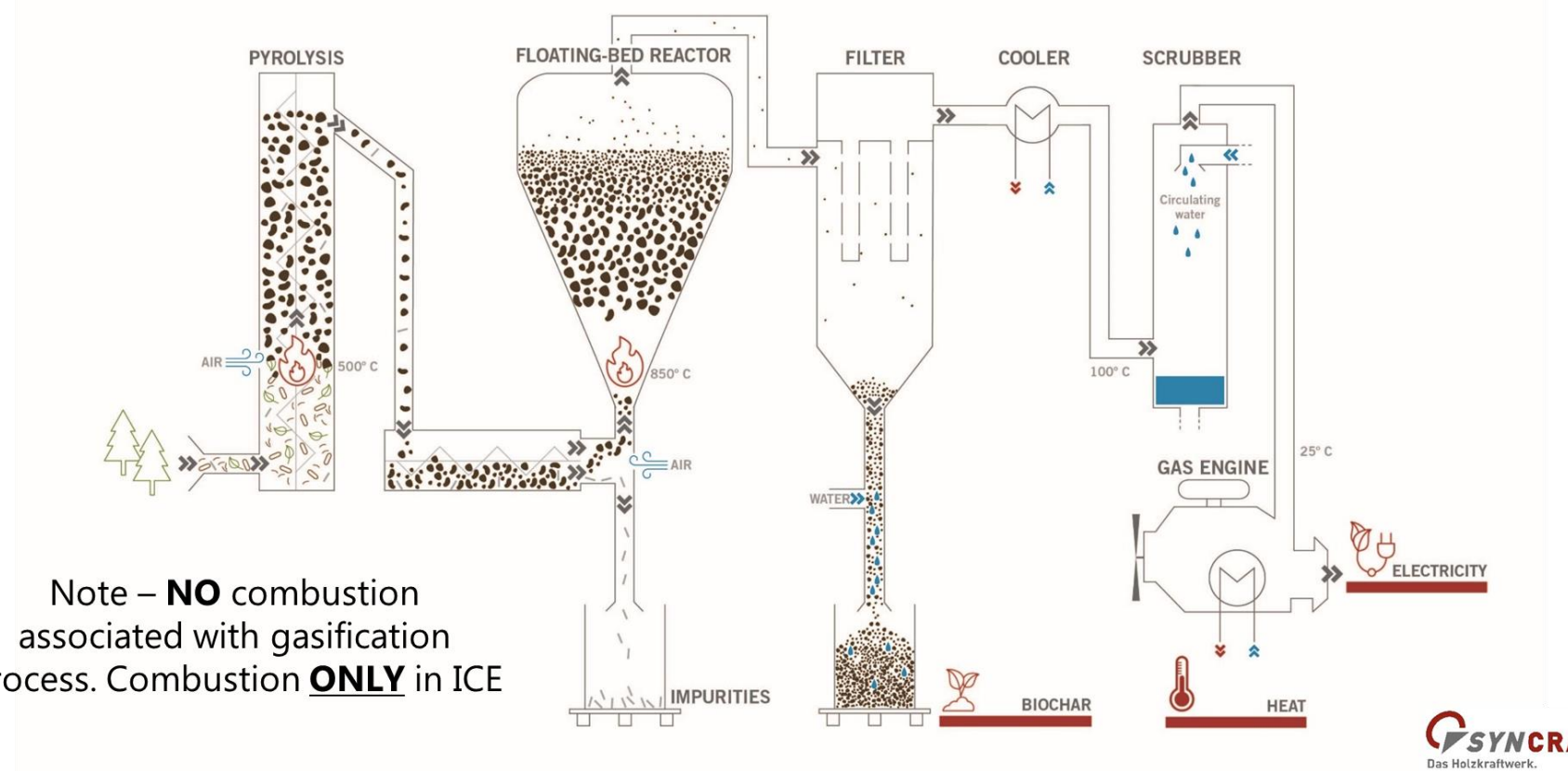
SYNGAS



Note – **NO** combustion associated with gasification process. Combustion **ONLY** in ICE

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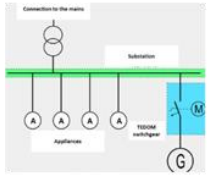
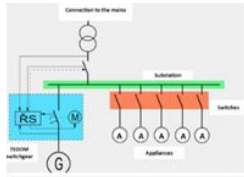
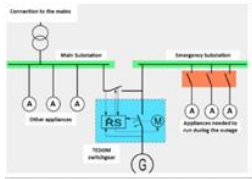
TEDOM CHP UNITS

Prime mover	Fuels	Power output	Design	Operation
Reciprocating engines	Natural Gas	Micro 7 - 60 kW	Open module	Parallel to the Grid
	 Biogas  Landfill Gas  Mine Gas  Sewage Gas  LPG and Propane 	 Cento 60 - 575 kW  Quanto 400 - 2000 kW 	 Sound Enclosure  Container 	 Island  Emergency 

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OPRA CHP UNITS

OP16-3A

Conventional diffusion type combustor

Gaseous and liquid fuels between 25-70 MJ/kg

Dual fuel operation

OP16-3B

Dry low emission combustor

Gaseous fuels between 38-51 MJ/kg

Dual fuel operation

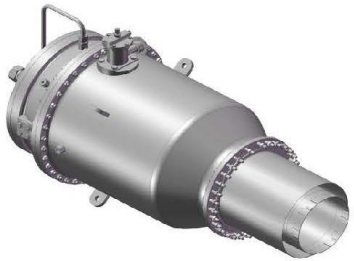
OP16-3C

Advanced diffusion type combustor

Gaseous and liquid fuels between 5-25 MJ/kg

Minimum LHV of 150 BTU/scf

Dual fuel operation



This 1.8 MW GTG can accept up to 90% hydrogen!

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CAPSTONE MICROTURBINES

Scalable Building Blocks

30kW or 65kW

VERGENT power solutions

65kW with CHP

200kW

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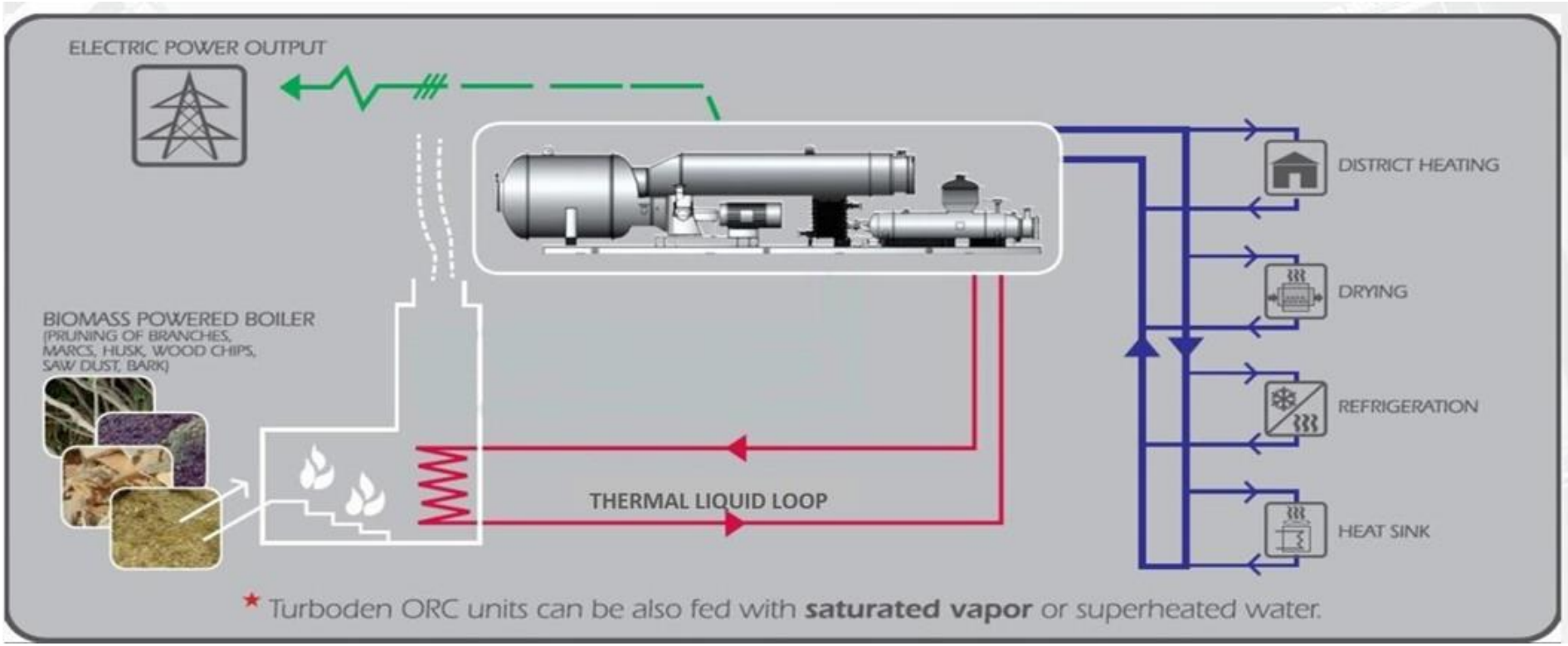
TURBODEN ORGANIC RANKINE CYCLE



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CARBOTECH PSA RNG SYSTEM

Borger, Germany

CEM ENGINEERING

Small Scale Gasification of Biomass

(Making ≤ 500 kW_e of Electricity)

SYNCRAFT®
Das Holzkraftwerk.

CEM ENGINEERING

SYNCRAFT SYNGAS SYSTEM

Dornbirn, Austria

CEM ENGINEERING

RECOMMENDATIONS

1. What carbon-neutral fuel is available near you?
   - Within say 1-2 hour radius of your site
2. Talk to your Natural Gas LDC to find out where they are at with respect to RNG.
3. Stay close to grants available from proceeds of Cap & Trade (CME Smart Green; "Green Bank")
4. Ensure your "prime mover" can accommodate retrofit to carbon-neutral fuel in the future.
5. Relax your financial feasibility threshold (example, accept 10 year payback instead of 5 year).

CEM ENGINEERING

CEM Engineering
227 Bunting Road, St. Catharines, Ontario

905-935-5815
matt@cemeng.ca

CEM ENGINEERING

Thank you!

Many thanks to Dr. Philippe Schild and Matt Lensink for their presentations, and to JJ Knott for facilitating.

This webinar has been recorded. Slides and recording will be emailed out after the webinar to anyone registered on EventBrite, and posted at http://greenhealthcare.ca/ghs

Useful links:

- Sustainable Technology Development Canada: https://www.sdtc.ca/en
- Canadian Manufacturers and Exporters SMART Green Program https://cmeweb.crm.eperformanceinc.com/smartgreen/
- MOECC Innovation Funding https://news.ontario.ca/mris/en/2017/04/supporting-clean-tech-and-reducing-greenhouse-gas-emissions.html?utm_source=ondemand&utm_medium=email&utm_campaign=p

Upcoming Webinars in This Series

- **Green Hospital Scorecard Top Performers Webinar**
  - Tuesday April 25th, 2017 11 AM – 12 PM EDT
  - Register HERE

- **Green Hospital Scorecard Energy Focus Webinar**
  - Thursday April 27th 2017 11 AM – 12 PM EDT
  - Register HERE

- ***Same call in information as today's call*