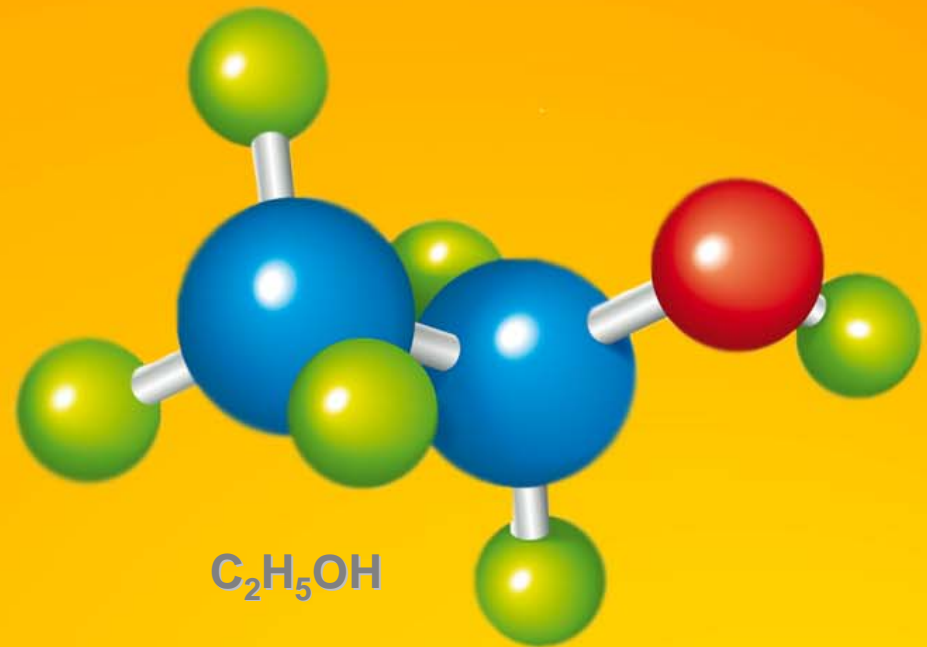


St1 Biofuels Oy Waste-Based Ethanol

2nd Stakeholder
Plenary Meeting of the
European Biofuels Technology Platform

January 22nd 2009



Ethanol Market Finland – waste based Ethanol



- Estimated fuel ethanol demand by 2020: 400.000 m³
- Theoretical waste based ethanol capacity by 2020: 600.000 m³

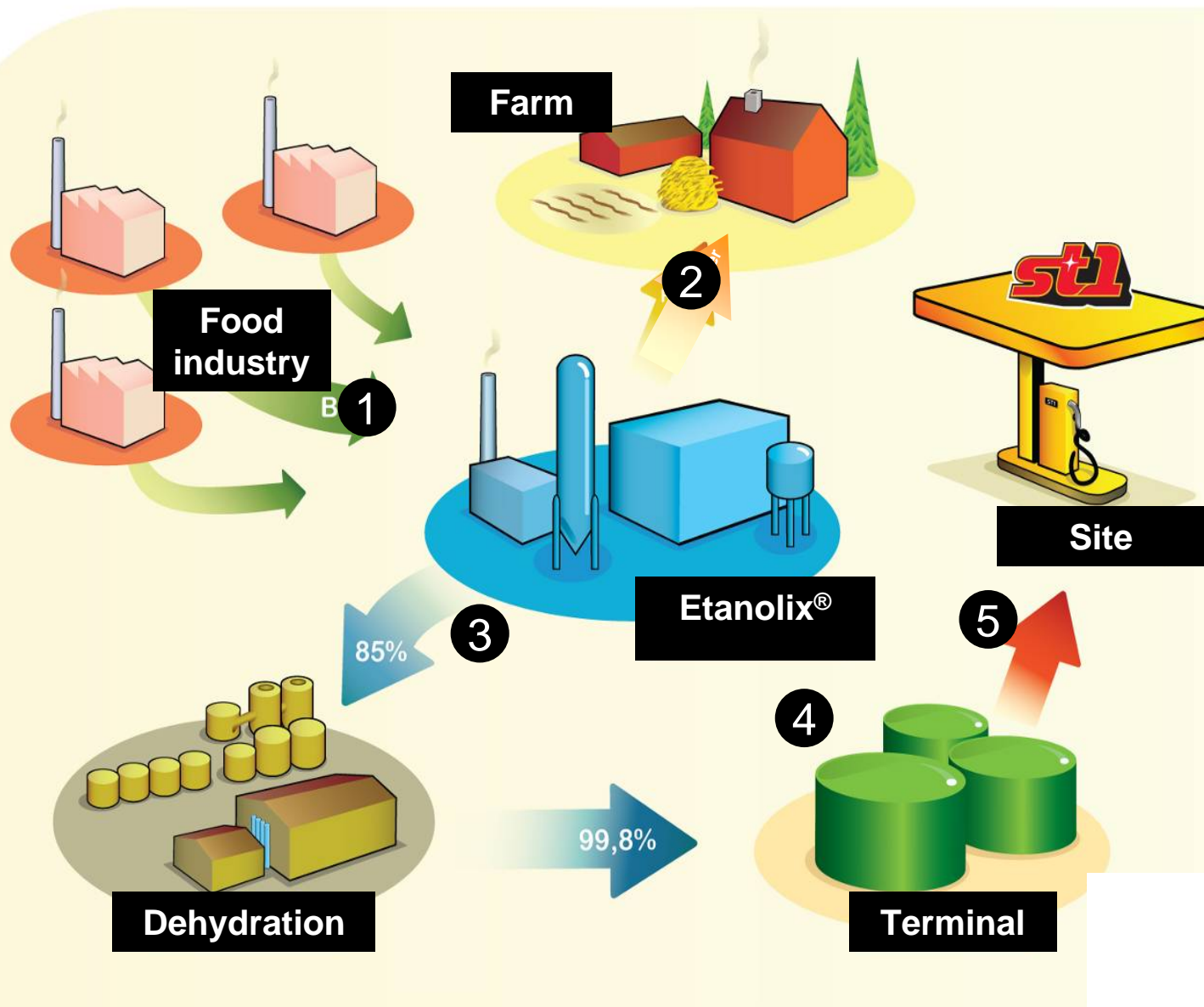
Theoretical Volume
Potential by type of waste:

St1 Objective by type of plant:

Feedstock	National potential (mill.liters/a)	St1 Plant type	First Plant	Plants by 2014 (#)	Production / Plant (m3/year)	Production at 2014 (mill. liters)
Food industry waste and side	40	Etanolix®	2007	10-15	750-2000	20
Municipal biowaste	40	Bionolix™	2009	10-15	500-2000	20
Household and industry	400	Cellunolix™	2010	10-15	10 000-25 000	200
Straw	120	Fiberix™	2011	100-200	200-500	60
Total	600				Total	300



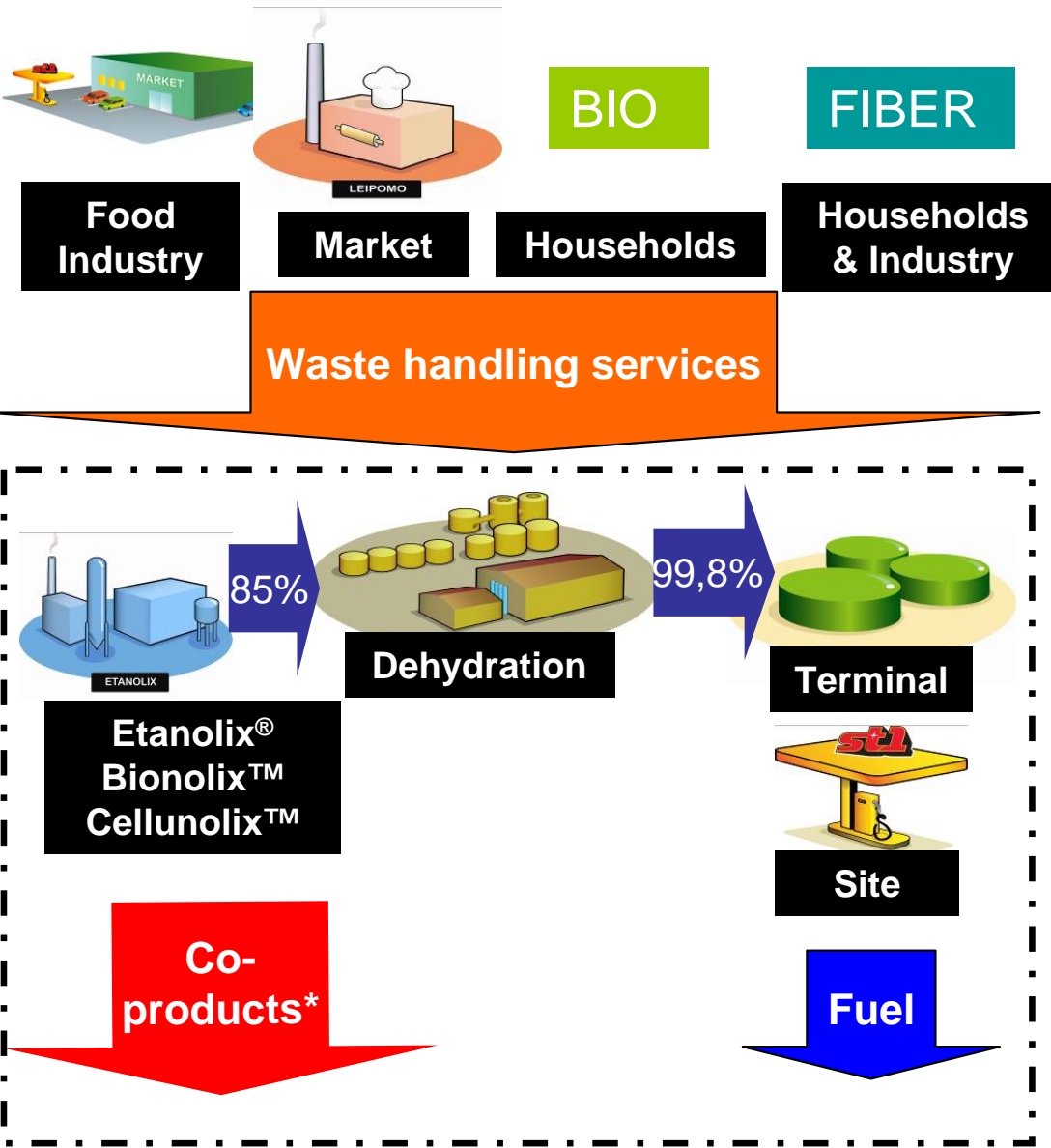
Etanolix[®] - Distributed Bioethanol Production



1. "CO₂ good" bioethanol is produced from waste material and industrial by-products using Etanolix[®] processing plants
2. The process creates a by-product to be used as animal feed, liquid fertilizer or solid fuel
3. The 85% bioethanol produced is then sent for dehydration for water removal
4. Produced bioethanol is blended – as a bio component – to make final biofuel
5. Biofuel is distributed to service stations

Low Life-Cycle CO₂ emissions through entire value chain

Value Chain:



*Animal feed, Fertilizer, Dry Fuel, Heat, Electricity

CO₂ emissions:

Source: WSP Study 2006

1. Ethanol (Etanolix/St1) ←

0,01 kg
CO₂/kgoe

2. Ethanol (Sugarcane/Brazil)

0,5 kg
CO₂/kgoe

3. Ethanol (Corn/U.S)

1,4 kg
CO₂/kgoe

4. Biodiesel NExBTL

1,6 kg
CO₂/kgoe

5. Biodiesel RME

1,6 kg
CO₂/kgoe

6. Fossil gasoline

2,7 kg
CO₂/kgoe

7. Fossil diesel

3,8 kg
CO₂/kgoe

kgoe = kilogram oil equivalent
41,868 MJ/kg (EtOH 26,9 MJ/kg)

St1 Biofuels Production units in operation

Etanolix® – Typical case

- Capex: first units 2m€
- Process heat from renewable source (pellets) or as excess heat from production unit to which Etanolix® is integrated to
- Footprint 25 x 25 m
- Fully automated – remote operation
- Modular: easy to configure, mass production, standard components, fast manufacturing & installation and relocation possibility

Etanolix® – Lappeenranta (Sept, 2007 -)

- "Stand Alone" unit using bakery and sweet industry side-streams
- Capacity: 1.000 m³/a bioethanol



St1 Biofuels Production units in operation

Etanolix® – Närpiö (May, 2008 -)

- Integrated unit using potato flake factory side-stream (20.000 tn/a)
- Capacity: 1.400 m³/a bioethanol

Etanolix® – Hamina (Oct, 2008 -):

- Integrated unit using bakery and sweet industry side-streams
- Capacity: 1.500 m³/a bioethanol

Dehydration – Hamina (Aug, 2008 -):

- Capex: 11m€
- Capacity 44.000 m³/a fuel grade 99,8%_{EtOH}
- to be doubled 1H2009

