

THE SWEDISH KNOWLEDGE CENTRE
FOR RENEWABLE TRANSPORTATION FUELS



Rear view mirror. Photo: Ingo Sturm, Pixabay (CC0)

ANNUAL REPORT 2017

ABOUT f3

The networking organisation f3

- f3 provides a broad, scientifically based and trustworthy source of knowledge for industry, governments and public authorities in their strategic planning of short-term actions to reach long-term visions
- f3 carries through system oriented research related to the entire renewable fuels value chain, both in the shape of syntheses of current research, and as supplementing studies
- f3 acts as a national platform stimulating interaction between large and relevant R&I programs, towards Horizon 2020 and for other international collaborative processes.

f3 partners include Sweden's most active universities and research institutes within the field, as well as a broad range of industry companies with high relevance. f3 has no political agenda and does not conduct lobbying activities for specific fuels or systems, nor for the f3 partners' respective areas of interest.



f3 also collaborates with the following:



All f3 partners, representing academia, research institutes, industry and authorities. Although the RISE institute's SP and Innventia have from 2017 merged under RISE, they participated as different f3 partners during 2017.

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INTRODUCTION

2017 was a very productive year for the networking organisation f3 (fossil free fuels) with a focus towards finalising the second phase (2014-2017). This has included evaluation of many different aspects of work, as well as preparing a forthcoming phase. Finalising a phase also meant completion of a number of projects and delivering results in reports as well as other publications, among them scientific.

The year started with the election of a new chair for f3 in early February, when a unanimous general assembly chose Annika Åhnberg as the successor of Thomas Johannesson, who had held the position since the start of f3 in 2011. Annika Åhnberg has a diverse background, including social work, political engagement. Also she holds positions in a number of scientific academies and societies, and is appointed honorary doctor in agriculture.



Thomas Johannesson, former Chair of f3, and successor Annika Åhnberg. Photo: Emmi Vooand. f3.

Several networking activities and conferences were arranged during 2017. In total, the events attracted participants from approximately 50 different organisations and stakeholders, including academy, authorities and industry, etc, creating a good potential for wide dissemination of research efforts and results within f3.

The research carried out within f3 includes both syntheses of current research on production and use of renewable transportation fuels, and supplementing system oriented research related to different parts of the entire renewable fuels value chain. Project outcomes provide guidance to policy makers, government, industry and other organisations facing decisions regarding renewable fuels, whether about policy objectives and instruments to achieve established goals, or investments in R&D, infrastructure and production.

On an international level, f3 has continued to act as the national advocacy platform for Sweden towards Horizon 2020. The work during 2017 has included a special focus on long-term development of bioenergy-related R&I in the EU, which is described further below.

Towards the end of 2017, Johanna Mossberg left the position as centre manager for f3. Her work and ambition to develop the centre work through internal as well as external collaborations has been greatly appreciated. During a recruitment period, Ingrid Nyström acted as stand-in manager.

PUBLISHED REPORTS

Results and reports from f3 projects as well as projects within the f3 and Swedish Energy Agency collaborative research program ‘Renewable transportation fuels and systems’ (Förnybara drivmedel och system) are accessible from the f3 website. Below is a list of reports published in 2017.




Title ¹ (report no)	Authors	Participating organisations
<i>Centralized vs. distributed biofuel supply chains based on liquefaction technology – the case of Sweden.</i> Report No f3 2016:11 .	de Jong S, Wetterlund E, Pettersson K & Hoefnagels R.	Bio4Energy (LTU), SP (RISE), University of Utrecht
<i>The role of electrofuels: A cost-effective solution for the future (Extended summary)</i> Report No f3 2016:13 .	Grahn M, Hansson J, Brynolf S, Hackl R & Taljegård M.	Chalmers, IVL
<i>Techno-economic analysis of biomethane production with novel upgrading technology.</i> Report No f3 2016:15 .	Ji X, Xie Y, Ma C, Björkmalm J, Willquist K, Yngvesson J & Wallberg O.	Bio4Energy (LTU), SP (RISE), LU
<i>Enabling the transition to a bio-economy: innovation system dynamics and policy.</i> Report No f3 2016:16 .	Coenen L, Bauer F, Hansen T, Hellsmark H, McCormick K & Voytenko Palgan Y.	LU (CIRCLE & IIIIEE), Chalmers
<i>Environmental and socio-economic benefits of biofuel production (Extended summary)</i> Report No f3 2017: 01	Martin M, Wetterlund E, Peck P, Hackl R & Holmgren K.	IVL, Bio4Energy (LTU), LU
<i>Barriers to an increased utilization of high biofuel blends in the Swedish vehicle fleet (in Swedish).</i> Report No f3 2017:02 .	Kastensson Å & Börjesson P.	Bio4Energy (LTU), LU, Lantmännen Energi
<i>Electrofuels from biological processes – a knowledge synthesis (in Swedish)</i> Report No f3 2017:03 .	Jannasch A-K & Willquist K.	SP(RISE)
<i>Public procurement as a policy instrument to promote the diffusion and use of renewable transport fuels (in Swedish)</i> Report No (f3 2017:04)	Kahn J, Palm J, Aldenius M, Backman F & Norinder H.	LU, LiU
<i>From visions to smart ICT- Local transitions to renewable transportation (Extended summary)</i> Report No f3 2017:05-A	Sundberg C, Kramers A & McCormick K.	SLU, KTH, LU
<i>Fossil fuel free municipalities in Sweden. Analysing modes of governing.</i> Report No f3 2017:05-B	Emtairah T, McCormick K., Leire C, Palm A & Dehod N.	LU (IIIIEE)
<i>Bio-SNG production by means of biomass gasification combined with MCEC technique.</i> Report No f3 2017:06	Mesfun S, Lundgren J, Toffolo A, Lagergren C, Lindbergh G & Engvall K.	Bio4Energy (LTU), KTH
<i>Fresh and ensiled crops – a new way to organize all-year round substrate supply for a biogas plant.</i> Report No f3 2017:07	Gunnarsson C, Ahlström A, Ljungberg D, Prade T, Rosenqvist H & Svensson S-E.	JTI/SP (RISE), Gasum AB & SLU
<i>Biofuels from agricultural biomass – Land use change in a Swedish perspective</i> Report No f3 2017:13	Ahlgren S, Björnsson L, Prade T & Lantz, M.	SLU, LU

¹ Report title may differ from the original project title.

Title ² (report no)	Authors	Participating organisations
<i>Biogas in the transport sector – an actor and policy analysis</i> (Swedish summary)	Lönnqvist T, Ammenberg J, Grönkvist S, Anderberg S & Sandberg T.	KTH, LiU, Stockholm gas
<i>Determination of potential improvements in bio-oil production. Production of transportation fuel components in value chains integrating pulp & paper and oil refinery industry.</i> Report No f3 2017:16)	Anheden, M, Kulander I, Pettersson K, Wallinder J, Vamling L, Hjerpe CJ, Fugelsang M & Håkansson Å.	Innventia (RISE), Chalmers, ÅF Industri, Preem
<i>Evaluation of biofuel production costs in relation to the new reduction obligation quota system. Project led by IVL and carried out in participation with Bio4Energy/LTU (in Swedish).</i> Report No f3 2017:17 .	Furusjö E. & Lundgren J	IVL & Bio4Energy (LTU). Additional input: Volvo AB, St1 AB, Swedish Energy Agency, Preem
<i>Comparison of diesel and gas distribution trucks – a life cycle assessment case study.</i> Report No f3 2017:20	Romare M & Hanarp P.	Volvo

POSTPONED PUBLICATIONS

For a small number of projects, publication of reports has been postponed due to scientific peer review processes. Accepted articles are, as a rule, linked by f3 via the project sites.

-  *A review of the synthetic step in the production of advanced biofuels* (participating organisations: KTH, LTH/Lund University, Linnaeus University)
-  *Biogas in the transport sector – An actor and policy analysis* (participating organisations: KTH, Linköping University, Stockholm gas, Göteborg Energi)
- ) *Profitability and greenhouse gas emission reduction potential of gasification based biofuels – comparison to electricity in transport by conventional conversion of biomass* (participating organisations: IVL, Chalmers).

SCIENTIFIC PUBLICATIONS

The number of scientific publication connected to work in projects carried out within f3 and the f3 and Swedish Energy Agency collaborative research program Renewable transportation fuels and systems (Förnybara drivmedel och system) has grown during 2017. In total, close to 20 articles were accepted and published during 2017 in journals like e.g. Forest Ecology and Management, Biotechnology for Biofuels, GCB Bioenergy, Applied Energy, Renewable and Sustainable Energy Reviews, Biofuels, Journal of Cleaner Production, International Journal of Life Cycle Assessment, International Journal of Electric and Hybrid Vehicles, Renewable and Sustainable Energy Reviews, Energy Policy and Biosystems Engineering.

² Report title may differ from the original project title.

OTHER PUBLICATIONS

Fact sheets have proven to be one of the most sought for pieces of information on the f3 website. In 2017, fact sheets on B100 (biodiesel) and on EU sustainability criteria for biofuels have been published.



f3 Stories No 6, June 2017 featuring the project series “BeWhere”. Graphic design: Lena Svantesson, Clout.

The fact sheets on DME and Methanol have also been updated with new numbers and information on current projects. Moreover, an overview of the proposed changes in the recast of the EU renewable energy directive (REDII), has been published by f3.³

In 2017, two new *f3 stories* have been published (in Swedish), one on European collaboration for transition to renewable fuels, and the other on the collaboration within the project series BeWhere. The stories have been compiled and written by Annika Söderpalm, Vera kommunikation.

A new series of articles was launched in 2017, *Fokus på* (in English: Focus on), where perspectives and good examples from the collaborative research program “Renewable transportation fuels and systems”, jointly financed by f3 and the Swedish Energy Agency, are highlighted. The first issue presents recent research related to the more social science oriented projects within the program area “Stakeholders, policy measures, and strategies”. Projects

within this category focus on the practical issues of the society shifting to renewable transportation fuels, along with analyses of what kind of strategies could be employed to ease the shift.











Header for the new series of articles “Focus on”. Photo: Freemages.com/Melissa Ricquier. Graphic design: Lena Svantesson, Clout.

³ Some changes were made in the proposal after the f3 overview was published. These are, as a consequence, not included.

SMALL f3 PROJECTS

Shorter projects with a smaller economic scope are carried out within the f3 partner network with funding from f3 partners only. In 2017, eight new projects within this category were initiated:

-  *Phosphorus recovery in algae-based biofuels.* Project lead and carried out by Chalmers.
-  *Vehicles and infrastructure for heavy long-haul transports fueled by electricity and hydrogen.* Project lead by KTH and carried out in participation with Scania.
-  *Evaluation of biofuel production costs in relation to the new reduction obligation quota system.* Project led by IVL and carried out in participation with Bio4Energy/LTU.
-  *Assessing positive social impacts – organizing and structuring the data collection.* Project lead by KTH and carried out in participation with IVL.
-  *Production of alternative transportation fuels from lignocellulose using process combination.* Project lead by Lantmännen Agroetanol and carried out in participation with Cellulose Fuels.
-  *Synthesizing LCA reports on transport fuels.* Project lead by Volvo and carried out in participation with Chalmers.
-  *Electrolysis and electrofuels in the Swedish chemical and biofuel industry: a comparison of costs and climate benefits.* Project lead by RISE (SP) and carried out in participation with Chalmers.
-  *Update of existing and addition of missing data into the f3 LCI data repository.* Project lead by IVL and carried out in participation with E.ON, Scania, Volvo, Lantmännen Agroetanol, Perstorp and Preem.

SEMINARS

In 2017, the f3 office co-organised one major external seminar, one external conference session and one concluding program conference.

FEEDSTOCK FOR SUSTAINABLE BIOFUEL PRODUCTION

Close to 60 people attended the seminar Feedstock for sustainable biofuel production that was co-arranged by f3, Bio4Energy and SLU at SLU in Umeå in February. The seminar offered different perspectives on the forest as a source of biomass for biofuel production. The participants also had the opportunity to go to Biomass Technology Centre (BTC) in Umeå and the BioEndev torrefaction demonstration plant in Holmsund for study visits.

MYTH-BUSTERS ON RENEWABLE FUELS

f3 arranged and chaired a session at the 2017 International Advanced Biofuels Conference. At the session, four researchers addressed common myths in the public debate on renewable fuels and showed, using a system approach, how scientifically based knowledge can provide guidance to policy makers, government, industry and other organisations. The conference was arranged by Svebio and held in May in Göteborg.

CONCLUDING RESEARCH PROGRAM CONFERENCE

Together with the Swedish Energy Agency and the Swedish Life Cycle Center, f3 arranged the concluding conference for the f3 and Swedish Energy Agency collaborative research program “Renewable transportation fuels and systems” (Förnybara drivmedel och system), a program that has been run from 2014 to 2017. Besides presentations from all 29 projects within the program, networking activities and discussions on future important tasks and questions regarding renewable sustainable fuels and the surrounding system were arranged. The life cycle perspective was introduced in several items

on the conference agenda, including the keynotes. In total, approximately 100 participants gathered at the conference which took place 25-26 October in Uppsala/Ultuna and was hosted by the Swedish University of Agricultural Sciences, SLU.



Audience listening to presentations in Uppsala/Ultuna at the Renewable transportation fuels and systems' concluding research program conference. Photo: Emmi Voogand, f3.

ADDITIONAL EVENTS

The f3 office participated as invited speakers at two different events in Norway, to speak about f3 and the general work as well as the research efforts that are performed within the networking organisation. The two events, the kickoff meeting of Bio4Fuels - a new centre for environmental research based at the Norwegian University of Life Sciences and lead by SINTEF, and a seminar arranged by the Norwegian environmental organisation Zero, both took place in February.



Experimental vehicles developed at the ITRL lab at KTH presented during the f3 coordinator group visit in April 2017. Photo: Emmi Voogand, f3.

In addition to the external seminars and the program conference, f3 partner representatives gathered in Stockholm (host: KTH Royal Institute of Technology), and in Uppsala (host: SLU Uppsala) for discussions on past and future projects and assignments.

A number of workshops connected to specific projects also took place during 2017. Presentations were held in both national and international meetings, seminars and conferences.

THE ROLE OF f3 AS SWEDISH ADVOCACY PLATFORM TOWARDS HORIZON 2020

Developing a sustainable transportation sector is a vital societal challenge for the EU and for Horizon 2020. The f3 centre is, since summer 2014, an appointed Swedish advocacy platform for renewable transportation fuels in relation to Horizon 2020. This project will run until the end of 2018.

As the Swedish advocacy platform, f3 engages in a broad range of activities, including those related directly to the development of work programs within Horizon 2020, to the long-term planning of European R&I, to general raising of European awareness about sustainable renewable transportation fuels, and to strengthening of Swedish actors in relation to EU R&I calls. In October 2017, f3 therefore arranged a workshop on “strong proposals”.

One primary channel for f3’s activities is the European technology and innovation platform ETIP Bioenergy. Several f3 partners are represented in the ETIP Bioenergy Steering Committee, including Ingrid Nyström (senior advisor for f3), and in its working groups. During 2017, the project has also helped financing the transfer of Chairman for the steering committee, from Ingvar Landälv, LTU, to Patrik Klintbom, RISE. Overall, the engagement in ETIP Bioenergy gives f3 the opportunity to actively influence the agenda from a stakeholder group perspective, and also to receive important insights in the work process of ETIP Bioenergy, the EU Commission and a range of European stakeholders.

In 2017, f3 and ETIP Bioenergy have been putting special focus on long-term development of bioenergy-related R&I in the EU, including input to current policy development (see the ETIP Bioenergy position paper on the Renewable Energy Directive II), and interaction with other platforms such as the ART Fuel Forum project. Specifically, there has been a strong involvement in the Commission’s development of an implementation plan for bioenergy and renewable transportation fuels (Action 8) within the updated SET plan (Strategic Energy Technology Plan). This implementation plan will play a vital role for the orientation of new research and innovation programs after 2020, including the development of flagship fuel production projects.

All in all, the collective work as advocacy platform gives the f3 working group the potential to make an impact on EU R&I developments, by extending and strengthening its network and by proactively compiling material that allows for fast and short notice responses on different actions, submission of comments etc.

f3 also continuously work to develop and strengthen its international network. In addition to the general EU-related activities this has, in 2017, primarily been directed towards development of collaboration with similar research networks and centres in Canada (BioFuelNet) and Norway (Bio4Fuel). As an example, in 2017, f3 representatives participated at different scientific meetings of Bio4Fuel – a new Norwegian centre for environment-friendly energy research.

WEBSITE, NEWSLETTERS AND SOCIAL MEDIA

The f3 website published 55 news pieces in 2017, covering projects, results, seminars, etc. The website had about 7 800 visitors, which is an increase by approximately 10 % compared to 2016. Just like earlier years, the fact sheets, especially the ones on HVO (Hydrotreated Vegetable Oil) and FAME (Fatty acid methyl esters), proved to be the most popular pieces of information. Besides the fact sheets, information on RED (Renewable Energy Directive) and the EU sustainability criteria generated some interest. Regarding projects, popular sought for reports were written within fields connected in different ways to social sciences, as well as reports on certain renewable fuels and their production.

While the website is in English, the f3 newsletter features the news in Swedish (with links to information in English). In 2017, it had approximately 420 subscribers who received seven newsletters.

The f3 twitter account (f3_centre), mainly with tweets in Swedish, was also used by the f3 office to share news stories from the f3 website in social media, which has enhanced the possibility for dissemination of research results and related information from the f3 network. In December 2017, the f3 twitter account had close to 200 followers, meaning that they more than doubled compared to December 2016.

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