

LAPSE: The Living Archive for Process Systems Engineering

by Thomas A. Adams II

I am pleased to announce a new open-access digital repository for the field of Process Systems Engineering called **LAPSE** (<http://PSEcommunity.org/LAPSE>).

Funded by pledges from the CACHÉ Corp. along with AIChE, CSChE, SINTEF Energy, and the Technical University of Denmark, you can use LAPSE to deposit digital materials related to research and education. Specifically, LAPSE is great for:



- Research article pre-prints, post-prints, and published open-access articles
- Conference presentations and seminars
- Technical papers
- Classroom slides
- Course materials
- Models and simulation files (Aspen Plus, GAMS, ProMax, Pyomo, etc.)
- Research data
- Source code
- Meeting funder or institutional open-access requirements

LAPSE
Living Archive for Process Systems Engineering

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LAPSE:2018.0134

Comparison of CO₂ Capture Approaches for Fossil-Based Power Generation: Review and Meta-Study

Thomas A. Adams II, Leila Hoseinzade, Pranav Bhaswanth Madabhushi, Ikenna J. Okeke
June 19, 2018. Originally submitted on June 12, 2018

This work is a meta-study of CO₂ capture processes for coal and natural gas power generation, including technologies such as post-combustion solvent-based carbon capture, the integrated gasification combined cycle process, oxyfuel combustion, membrane-based carbon capture processes, and solid oxide fuel cells. A literature survey of recent techno-economic studies was conducted, compiling relevant data on costs, efficiencies, and other performance metrics. The data were then converted in a consistent fashion to a common standard (such as a consistent net power output, country of construction, currency, base year of operation, and captured CO₂ pressure) such that a meaningful and direct comparison of technologies can be made. The processes were compared against a standard status quo power plant without carbon capture to compute metrics such as cost of CO₂ emissions avoided to identify the most promising designs and technologies to use for CO₂ emissions abatement.

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Meta

Record Statistics
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Version History

- [v2] (Added errata, revised high-res figures) Jun 19, 2018
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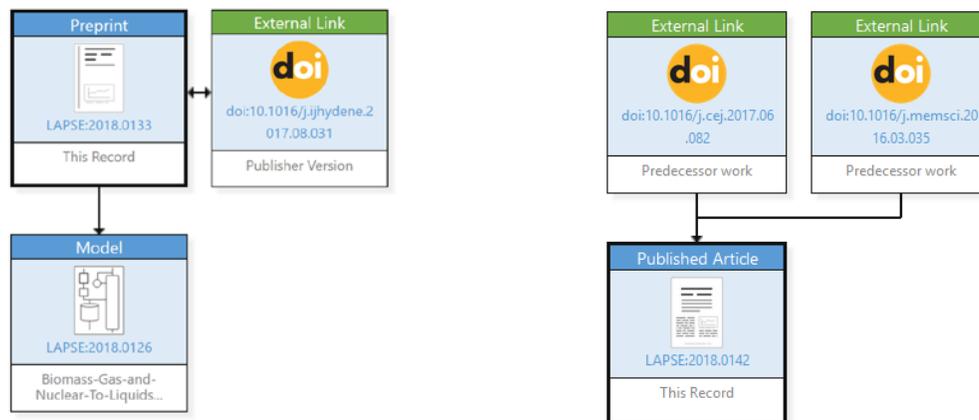
Original Submitter

Viewing a record in LAPSE. Records contain important meta data that allow indexing by Google Scholar, and contain a rigorous version control and tagging system. See <http://PSEcommunity.org/LAPSE>

I originally created LAPSE at the request of members of the PSE community because we do not have a repository for the PSE field. We wanted the repository to be more than just a place to throw your preprints to satisfy a funder's open access requirement—we wanted it to be a part of a broader community that connects researchers, educators, and practitioners to the material. That is why it is hosted at PSEcommunity.org, the site originally conceived by CACHe (at the suggestion of Prof. Mario Eden) meant to foster the development of CACHe related educational materials.

Record Maps

LAPSE has a number of unique features that make it stand out and are particularly useful for our community (see <http://psecommunity.org/lapse/about-lapse> for more information). One key feature is record maps, in which someone can connect their LAPSE submissions to other LAPSE submissions, or, to outside digital objects (currently anything with a DOI, or anything in arXiv) in order to create a concept tree of how the work fits into the broader context. This tree is displayed visually at the bottom of each record.



Simple record map examples submitted by various users. (Left). This record is for a pre-print of an article, but conceptually it is linked to the publisher's version of the article as a "sibling" work, and, another LAPSE record which is a derivative work (a model). In this case, the user is trying to show that the model was derived conceptually from the material presented in the paper. (Right). This is the record for an open access article submitted to LAPSE. This record map shows that the present work follows from two predecessor works (not in LAPSE).

For example, you can submit a pre-print to the database, and then link it to the publisher's final version of the article. You can link it to another record which contains the slides for a conference presentation in which the results of this paper was presented, link it to model or simulation files that were derived from or were used in the work, or even link it to papers by other groups which were particularly influential in the development of the present work. From a CACHe perspective, you can also connect classroom materials to research in the same way, such as providing lecture slides and then linking them to source information (textbooks, papers, etc.), videos, worksheets, homework files, spreadsheets, etc. This gives the user an easy to follow overview of the work and how it fits into the big picture.

This is a fantastic way of connecting the research and educational materials to each other. For example, when a user comes to find a paper, they are instantly and visually shown how this research material has been taught in the classroom, connecting them directly to the material that can help them understand it better. Papers on education, pedagogy, and best practices can be connected to each other to show how teaching methodologies are being applied, along with connections to CACHe aids like simulation files and spreadsheets. These are some of the key ways in which LAPSE will help disseminate our work across the PSE community.

Open Access Culture

One of the key driving factors behind LAPSE is the emergence of the open access culture. Although open source software continues to grow in popularity, this has not really reached the CACHe community in the way that we would hope. Many funders and institutions now increasingly require that the research they fund be made available to the general public within a certain period of time. Often, pre-print or post-print deposits into LAPSE will satisfy this requirement, as LAPSE was designed to do.

However, this does not go far enough. Even when the research articles we write are made available to the public, PSE researchers too often withhold the digital assets that made the research possible, such as computer models, simulation files, GAMS code, spreadsheets, or source code. We do this for a number of reasons, such as being afraid that someone will find errors in our work, or being afraid that a rival colleague will take the fruits of our efforts (sometimes requiring years of development), make a few changes, and bang out a quick paper using it in a very short amount of time. Neither of these are valid excuses, and I am personally guilty of both. However, considering how long it often takes to develop these digital assets, the benefit to society is quite extraordinary if they were to be released for scientific or educational use. Releasing the codes, warts and all, makes it possible for others to reproduce or build upon scientific work rapidly, greatly increasing the rate of discovery in our field as a whole. Furthermore, educators can immediately adapt those codes for use in their classrooms. This is why LAPSE is dedicated to both research and educational submissions, to greatly facilitate knowledge transfer between them. I have begun releasing my digital assets (starting with Aspen Plus files), and all of my classroom lecture slides as well through LAPSE. I encourage you all to do the same.

Help Needed!

LAPSE is a community effort so we need lots of help. Any interested person is encouraged to contact me at info@psecommunity.org with inquiries. Duties may range from posting news to the front page, moderating discussion forums, validating submissions (checking for relevance or abuse), or helping write and improve the underlying PHP code that drives the site. But most of all we need you to share your papers, models, classroom materials, simulations, spreadsheets, conference presentations, and connect them to other users.